

THE IRON AGE

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A Brass Foundry of Modern Appointments

Notable Three-Story Addition to the Plant of
the Eynon-Evans Mfg. Company, Philadelphia,
Giving 2,000,000 lb. Yearly Casting Capacity

What can be done in brass foundry construction and operation, under conditions where the expansion is restricted by available ground space, due to location and environments, is aptly illustrated by the new plant of the Eynon-Evans Mfg. Company, Fifteenth and Clearfield streets, Philadelphia. The original foundry occupied a ground space 20 x 40 ft., to which additions were made from time to time until available ground was fully occupied, but the constantly increasing business demanded more space. It was then decided to erect a three-story modern foundry, the erection and equipment of which was to be carried on without serious interference with the continuous operation of the old foundry department. The melting capacity of the plant now aggregates 6000 lb. per heat, with a molding capacity of 2,000,000 lb. of castings per year.

The building decided upon is of steel frame and brick and heavy mill construction, 50 x 115 ft., on the floor plan, giving with wings the ar-

range shown in the accompanying drawings. The building was designed with extra heavy weight carrying capacity. The window area on the various floors is large and permits the daylight to flood the full floor area. The building is served with a 5000-lb. Albro Clem electric elevator, which travels to the roof level, the elevator winding machine being located in a tower extending above the roof line of the building. A fire tower and stairway, located at the opposite end of the building, gives easy access to all floors. The ceilings of the different stories are

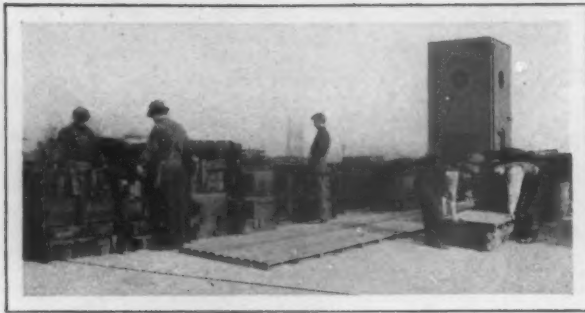
high, ranging from 14 ft. on the first to 10 ft. on the third, giving ample clearing space for smoke and fumes when the molds are being poured.

Owing to limited ground floor space for flask storage, the roof of the building, which is protected by the high parapet walls, was made adaptable for flask storage, the full area of the building being used. The roof proper is laid on 6 x 12-in. joists, covered with 1 1/4-in. yellow



Melting Department of the Eynon-Evans Mfg. Company.

The upper picture shows the tilting oil furnaces in the melting room; the left of the lower pictures shows the oil or coke fuel furnaces with the lids off and that at the right shows the furnaces with the lids off; against the wall may be seen the racks for storing and drying crucibles.



Storage of Flasks on the Roof.

pine planks, on which is laid a four-ply felt and gravel roofing. This is protected by wooden walks and the flasks are laid either on the roof direct or on special wooden frames. Ultimately it is intended to make an addition, which will serve as a secondary roof to protect the flasks from the weather.

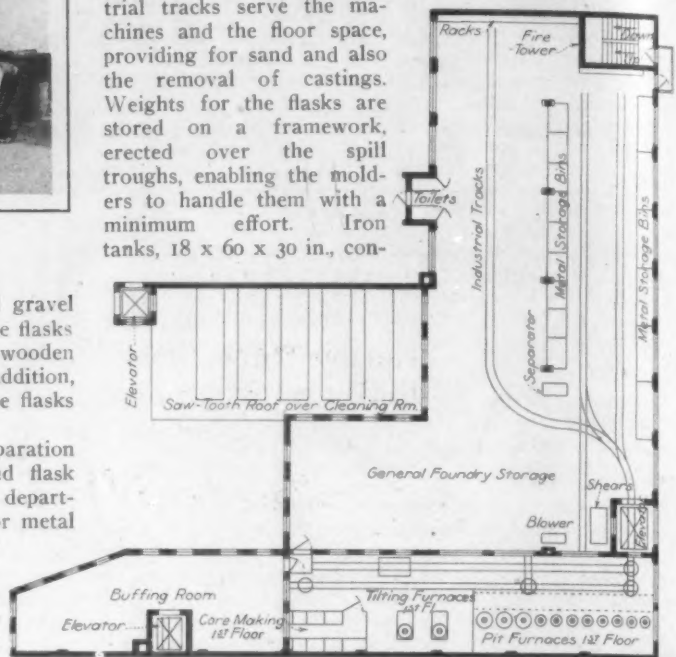
The third floor is used for metal storage, preparation of scrap into charging shape, pattern fitting and flask making shop, pattern and general foundry storage departments. The northern half of this floor is used for metal storage; twelve steel bins are located along the wall side, while nine are located along the center line. Each of these bins measures 4 x 6 x 4 ft., and the metal storage capacity aggregates 100,000 lb. The full floor carrying capacity is estimated at 200,000 lb.

Industrial railway tracks facilitate the handling of material, carried on trucks in steel tote boxes. Facilities are provided for the weighing and proportioning of the necessary charges. The tracking extends directly into the elevator floor, on which the tracks are depressed, and this allows the extension of the tramway system to all floors of the building, as well as to other departments of the plant. A Ding electric separator is conveniently located at one end of the building and power for the machine is obtained from an overhead electric motor. Adjoining the elevator shaft a shearing machine for cutting scrap to chargeable length is to be installed. In the southern half of this floor a space 25 x 100 ft. is used for a metal pattern fitting shop, with the necessary metal and woodworking machine tool equipment, operated by overhead motor-driven line shaft. A pipe and fitting storage department occupies, together with the necessary machinery, a portion of this floor, while along the rear wall are steel racks for pattern storage, having a capacity of 600 match plates for molding machine work.

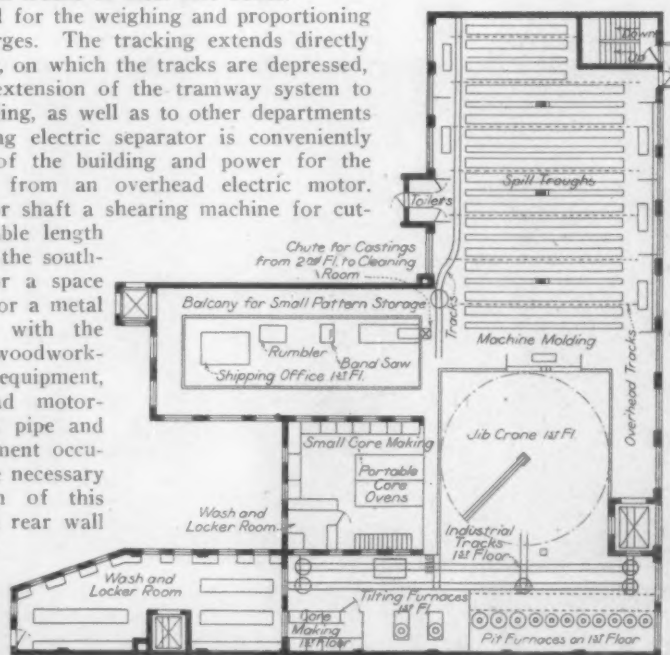
This floor of the building is heated by exhaust steam from the machine shop, piped through the center of the floor space and supported from the roof rafters. These, it is intended, will be encased and by means of a fan system the heat forced to various parts of the room and building. Storage room for linings for the melting furnaces and various foundry supplies and equipment is also provided on this floor, care being given in the general arrangement to throw weight toward the center and wall lines of the building. Tungsten incandescent lamps are distributed at various points and at all the machine tools on this floor, in order to provide artificial illumination.

The second floor of the building is entirely devoted to molding machine work, the floor space for which measures 50 x 125 ft. A portion is open to provide crane room for heavy work on the first floor. There are four Tabor molding machines, with provision for two more. Spill troughs of

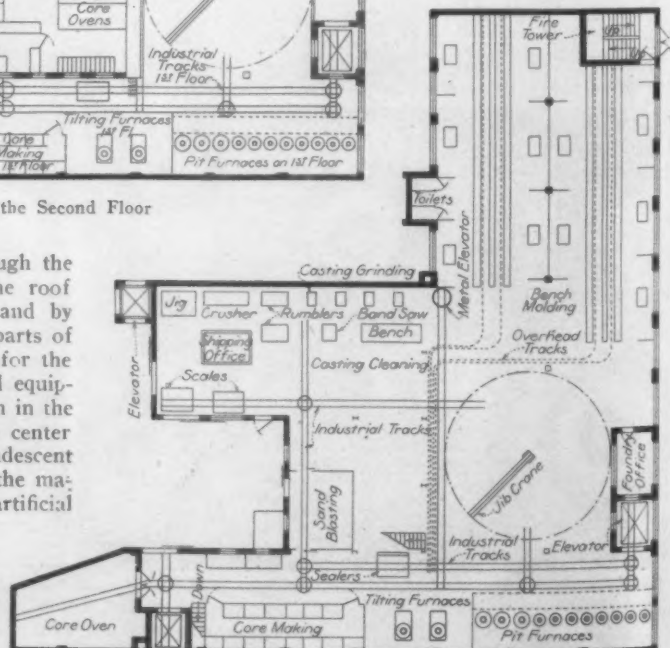
special design extend across the width of the floor and have a capacity of 500 standard size 12 x 18-in. flasks. The molding machines are located at the side walls, where adequate daylight is provided by numerous windows. Industrial tracks serve the machines and the floor space, providing for sand and also the removal of castings. Weights for the flasks are stored on a framework, erected over the spill troughs, enabling the molders to handle them with a minimum effort. Iron tanks, 18 x 60 x 30 in., con-



Plan of the Third Floor



Plan of the Second Floor



Plan of the First Floor

taining water for blowing out cores, are suitably located on the molding floor.

Overhead hand hoists are used to carry the crucibles containing the metal to be poured, the overhead tramway serving each of the line of spill troughs. The hot metal is delivered to the second floor by means of a special crucible truck, elevated by means of an electric hoist. This transfer carriage or truck is of special design. The frame is of cast iron, mounted on a four-wheel truck having 8-in. wheels

and the bottom plate extends out over the wheel flanges. The wheels have ball bearings and operate on a 16-in. gauge track. Uprights at the front and rear carry the cradle, which holds the crucible containing the hot metal.

After taking the crucible from the melting furnace, it is placed in this carriage and pushed along the tramway to the elevator, which is of special design. It includes a 4-ft. steel cylinder. The tracks in the floor of the elevator cage are depressed and the cage itself is enclosed on both top and sides to prevent anything from dropping into the crucible. On reaching the second floor tongs are again used to handle the crucible, which is carried by the overhead hoists to the molds to be poured. The carriage for the crucible will take pots ranging from No. 60 to No. 125.

Four flaming arc lamps are used for general artificial illumination, while individual incandescent electric lights are used at the various molding machines. A 20 x 24-in. heavy steel chute leads from the second floor to the cleaning room on the first floor, and greatly facilitates the handling of castings to that department.

On the first floor is located the main foundry and the melting furnaces; adjacent are the core rooms and ovens, the cleaning room and the mechanical equipment. A floor space 50 x 100 ft. is used for bench work, and approximately the same space for floor work. On the bench work floor facilities are provided for fourteen molders, sheet iron partitions separating the floors. The floors are of vitrified brick, laid in concrete. Each molder has a specially designed molding table, 2 x 6 ft. on top, with an 8 x 16-in. extension. The top is of cast iron and of a grating design, to permit surplus sand to fall through to the floor. Adjusted to the front of the table is a valve mechanism for operating a vibrator when lifting pat-



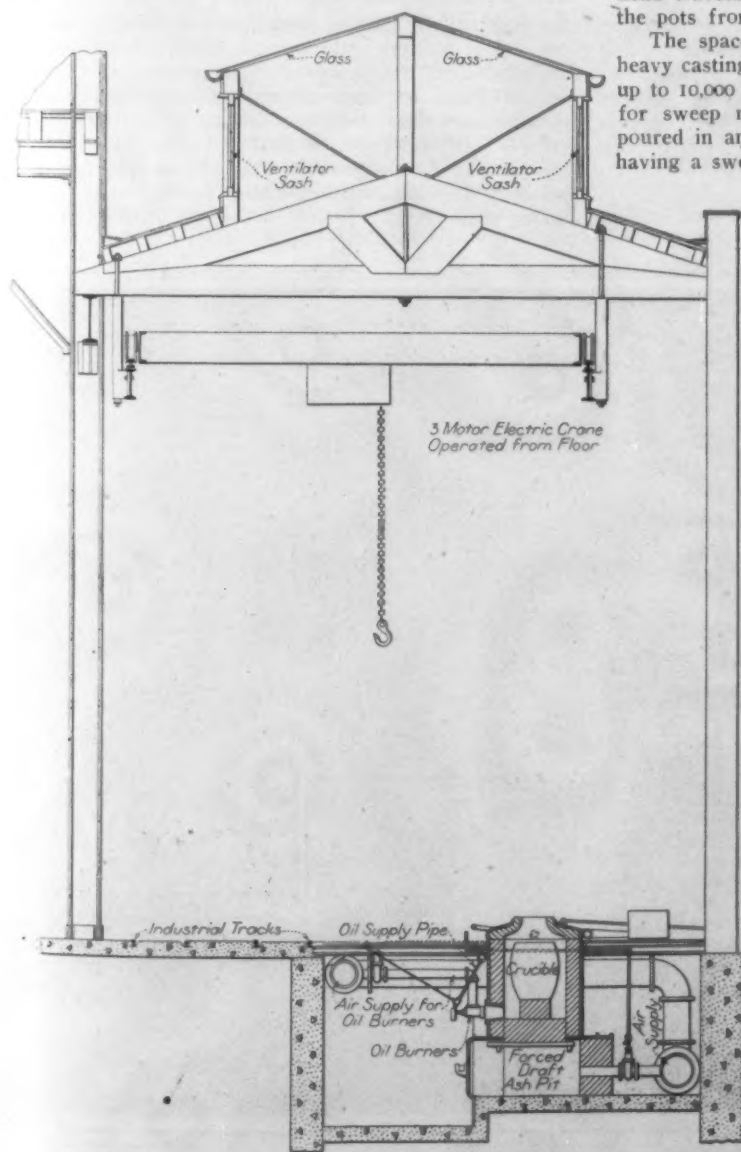
Metal Furnace Pit, Showing Oil and Air Piping and Adaptation of Furnaces to Change from Oil to Coke Fuel

terns in the molds. A side bracket also provides for the maintenance of a supply of sand, within easy reach of the molder's hand. The spill troughs, shown in one of the illustrations are of cast iron, in sections 6 ft. long. A central rib extends about 4 in. higher than the outside face, allowing the flask to be readily placed flat or on end for pouring. The weights for the molds are, on this floor, placed on an upright framework between the floors. Overhead traveling hand hoists serve as a means of carrying the pots from the melting furnaces to the molding floors.

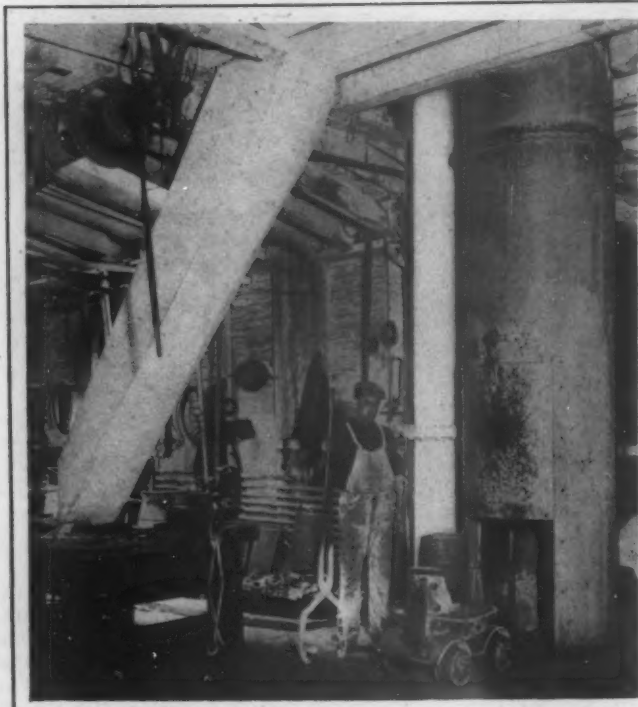
The space on this floor given over to the molding of heavy castings covers 50 x 100 ft. Here are made castings up to 10,000 lb. weight. A pit 10 x 10 x 15 ft. is available for sweep moldings and castings of length, necessarily poured in an upright position. A 5-ton electric jib crane, having a sweep of 20 ft., serves this molding floor.

Eleven melting furnaces for use either with oil fuel or coke, and two oil-fired tilting furnaces, comprise the melting equipment and are located in an extension 20 x 90 ft. at the eastern end of the building. The battery consists of four pot fires for No. 80 crucibles, four for No. 125, one for a No. 200 and two for No. 300 crucibles, and two Steele-Harvey tilting furnaces for using No. 300 crucibles. The furnaces can be changed from oil to coke fuel if necessary in a very short time, by stopping up the oil inlet and removing the bottom block, which is laid upon the grate bars. When oil fuel is used the crucible in the furnace rests on a deflecting block, which directs and distributes the oil flame and keeps it from playing directly on the crucible. An underground pit 7 ft. deep and 40 ft. long, in front of the furnaces, permits ready access and also facilitates the inspection and making of repairs to the oil or air pipe lines. Valves set into the grating, which covers the pit, give control of the supply of oil and air.

The furnace tops are of cast iron, lined with fire brick, and a counterbalance weight facilitates the lifting of the tops, while a projecting arm automatically turns the inner face of the lid to the rear, away from the operating side of the furnace, thus to protect the operator from the excessive heat. Behind the furnaces are the pot racks for storing and drying crucibles. A 3000-lb. Alfred Box & Co. electric traveling crane, operated from the floor and travelling the length of the melting department, serves the furnaces, being used for the charging and drawing of the pots. An industrial railway serves the furnaces with metal for charging, while also for the transferring of metal by means of the



Section Through Melting Department Building



Hot Metal Truck at Elevator and Chute to the Cleaning Room on First Floor



Metal Truck at Elevator on Second Floor, Showing the Truck without the Crucible

crucible carriage, referred to for the delivery of metal to the second floor. The metal for pouring molds on the first floor is conveyed to the bench molding floor by means of overhead traveling hoists, the system extending directly into the melting department. An average fuel expense using oil in these furnaces is stated to be about 9 cents per 100 lb. of metal melted, with oil based at a cost of 3 cents a gallon.

The power equipment for the department is located to

the right of the melting department. Here two independent sets of blowers and pumps for both oil and air are installed. It is the company's practice to use alternately one of these sets each month, to insure the fitness for operation of the reserve set should it perchance be required. Electric drive is used for both the blowers and the pumps. No. 40 Buffalo Forge blowers, giving an air pressure of 3 in., are used, while the oil pressure is maintained at 30 lb.



Main Foundry Floor, Showing Molders' Tables and Spill Troughs and Overhead Hoist Runways.

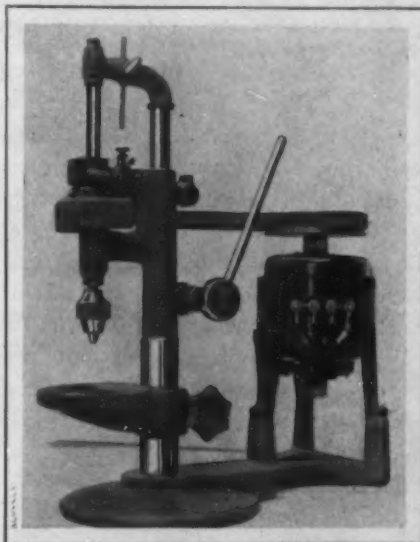
A large area of window space makes all parts of the building extremely bright in daylight. Ventilation in general is obtained from the windows, although additional facilities are provided by the location of suction fans at several points. The roof of the melting department has a ventilated sash and a glass hood for the admission of light. Toilet rooms are provided on each floor. The adoption of a system of calls by means of a Klaxon horn, located in the different departments of the plant, enables the office to reach any department promptly, on hearing which signal the party wanted can immediately communicate with the office through a system of telephones conveniently located in all departments.

Small Motor-Driven Sensitive Drilling Machines

A new line of motor-driven sensitive drilling machines suitable for machinists, garages, jewelers, etc., has been recently designed by the Langelier Mfg. Company, Providence, R. I. These tools are made in two sizes and can be attached to the bench or to the floor. One of the special features of the drilling machine is the great sensitiveness and precision secured for the drill. The spindle floats inside a sleeve which is continuous through the two spindle bearings and the driving pulley is keyed to the sleeve and not to the spindle. In this way great sensitiveness and precision are said to be secured and no matter how tight the bit may be it is emphasized that there will be no jerking of the spindle and in this way the wear is practically eliminated. The feeding of the spindle in the floor machines can be done either by the hand lever at the side of the column or by a foot treadle with the rod passing inside the column, the same arrangement being also available for the bench type.

The drilling table has a vertical adjustment of $4\frac{1}{2}$ in. and it can be swung to the side if desired. For very accurate depth drilling a vertical gauge rod which can be seen through the spindle frame is set to the proper distance and secured by a wing nut. The lower end of the rod bears on a hardened fine pitch knurled screw and in this way very minute settings can be made. The vertical screw is kept at the height wanted by a binding screw at the side.

smaller takes a No. 11 Skinner or Jacob's chuck with a capacity for drills having a maximum diameter of $7/32$ in., while the larger size will take a No. 12 Skinner chuck for drills up to $3/8$ in. The weight of the bench drilling



A New Type of Motor-Driven Sensitive Bench Drilling Machine Built by the Langelier Mfg. Company, Providence, R. I.

machine equipped with the driving motor is 50 lb., while that of the floor machine is twice as great. The space required by the two styles is 20×12 and 20×16 in., respectively.

German Practical Foundrymen's Convention

The German Foundry Trade Association (Verein Deutscher Gessereifachleute), a separate organization from the German Foundrymen's Association, will hold its convention this year from May 29 to June 2, in Berlin. The programme includes, besides the inspection of the foundries of the Siemens-Schuckert works, the presentation of the following papers:

"Recent Developments in Foundry Operations," by Prof. A. Nachtwels, Hanover.

"Methods of Operation in American Foundries," by C. Humpertinck, Durlach.

"Modern Transportation and Lifting Apparatus in Iron Foundries," by Hubert Hermanns, Duisburg.

"Modern Simplified Methods of Production in Art Castings," by Max Küller, Berlin.

"Advantages and Defects of the Bonvillain Machine Molding System and Its Latest Developments," by Arthur Lentz, Düsseldorf.

"Roasting of Cast Iron," by Dr. Arndt, Berlin.

"Small Bessemer Converter Practice," by Carl P. Lavall, Magdeburg.

"An Investigation of Molding Sand from Halberstadt."

"Operating Economies and Improvements in Metal Foundries," by C. Hunger, Berlin.

"The Advantages of German Foundry Equipment over French and American Systems," by K. Axmann, Cologne.

The formal opening of Rand Hall, Sibley College, Cornell University, is scheduled to take place on the date of this issue, May 23. The building is the gift of Mrs. Florence O. R. Lang as a memorial to Jasper Raymond

Rand, Jasper R. Rand, Jr., her brother, and Addison Crittenden Rand. Jasper Rand, Jr., was formerly a student of Sibley College and succeeded his father as president of the Rand Drill Company. Rand Hall is a three-story structure, 50×170 ft. in size, of steel with concrete fireproofing, Fenestra steel sash and a sawtooth skylight. It is to accommodate among other things the machine shop of Sibley College.



Metal Storage Bins on Third Floor, Showing Tracking Leading to Elevator; Heating Pipes Along Interior Columns, and Horn of Office Communication System

The drill spindles are driven by a $3/4$ -hp. electric motor which transmits its power through an endless belt. To prevent the belt from hitting the operator's face in case of breakage due to the high speed, 2000 r.p.m., a belt guard is located over the spindle pulley. Ample and effective lubrication is provided and all running parts are designed for taking up wear and also for replacement when worn out. Two sizes of machine are built. The

The American Iron and Steel Institute

A Noteworthy Meeting at Which Commercial and Technical Subjects Were Ably Discussed —The Work of the Institute to Be Enlarged

The second general meeting of the American Iron and Steel Institute, held at the Waldorf-Astoria, New York, on Friday, May 17, was probably the most interesting in its history. Partly through the prominence given in the daily press to the work of certain committees of the Institute having to do with commercial questions, the wide scope of its activities has not been appreciated. The papers presented at last week's meeting, dealing with both commercial and technical subjects, are a most interesting contribution to the literature of the American iron and steel industry. As a prophecy of what is to be looked for at subsequent meetings they are highly significant. The meeting also showed that in spite of the developments of the past year, which have been considered quite unfavorable to the cultivation of social relations between steel manufacturers, there is a keen appreciation of such opportunities to meet and discuss questions of common interest. In fact, the desire appears to be general for more than one meeting a year, and steps were taken looking toward semi-annual gatherings—one of the meetings to be held in New York and the other at a steel manufacturing center. An interesting announcement made in President Gary's annual address was that in the near future the work of the American Iron and Steel Association, so long carried on at Philadelphia under the able direction of James M. Swank, would be transferred to the American Iron and Steel Institute. The membership of the Institute has increased to 425 and with the recent reduction in dues a very substantial addition is expected in the coming year from the ranks of the selling and operating staffs of the iron and steel companies.

President Elbert H. Gary called the first session to order in the Astor Gallery of the Waldorf-Astoria at 11 o'clock Friday morning. For an hour previous the members had mingled in the adjoining rooms, which were given up to assembling and registration. It was plain that this feature of the stated meetings of the Institute is one on which large store is set. Never in the history of the industry has there been such closeness of acquaintance among manufacturers and men prominent in sales and operating departments. The registration showed an attendance of close to 225, and a number of those present were participants for the first time in a meeting of the Institute.

Judge Gary's presidential address, which was unwritten and elaborated from scant notes, was listened to with the closest attention. It did not ignore the conditions in the steel trade which have made such serious inroads upon profits in the past year; at the same time it was most temperate and marked throughout by the spirit of optimism which has always colored the speaker's utterances concerning trade conditions and prospects. Judge Gary spoke as follows:

President Gary's Address

It is my very great pleasure to welcome you to this annual meeting of the American Iron and Steel Institute. I assure you it is a great honor to be placed in the position of president of the Institute, as it is a great pleasure to be associated with such as you. I must apologize for not having prepared a formal address. My time has been very much occupied, largely by circumstances beyond my control. (Laughter.)

The Institute Growing

I may say the Institute is progressing. It is a great satisfaction that during the last year the membership has increased from about 320 to about 425. I think that does not represent the total membership which we may expect during the next few months. I would urge upon every member the desirability of suggesting to others that they join this association. It should be of advantage to all the members. At the suggestion of some of the members of the Board of Directors we have in the past year increased the number of directors from fifteen to twenty-one in order to give a fuller representation of the various people and concerns interested in the work of the association; and we have also decreased the admission fee and the annual dues to sums which meet the ability to pay of those who have heretofore refrained from joining the association because the fees seemed too large. Some ideas which we had at the organization of the association have

been somewhat changed, and for that reason we felt that the amounts fixed at the outset for admission and dues were too large. Now that these sums are small we hope you will all make a special effort to have your associates, and those of you who represent large corporations, your subordinates, become participants in the efforts which are being made by the association to advance the interests of all concerned.

Progress in Welfare Work

During the year we have established and maintained a department of welfare work which has been under the immediate direction, so far as the Institute is concerned, of Dr. Darlington, who is the representative of a committee on welfare, made up of seven members of the Board of Directors. This committee has been making very substantial progress in the direction of bettering the conditions of the workingmen. If I may quote from the secretary on this subject:

"Already the seven-day week has been practically eliminated in all the larger plants of the iron and steel industry, even in the continuous operations where it had been regarded as unavoidable. Much thought has been given to the question of hours of labor, and better conditions are being gradually worked out. The prevention of accidents has been investigated and safety devices costing vast sums of money, but worth all they cost in preventing human suffering, have been installed. A beginning has been made in building up a museum of safety devices where the best things of the kind known in the world can be seen and studied by members of the Institute. In more and more of the companies sanitary officers are being appointed, and the health of employees is having more consideration than ever before. Hundreds of thousands of health circulars have been sent out by the Institute. A monthly publication to serve as a medium of communication with its members has been authorized by the directors, and the near future will see the beginning of its publication."

Interest of Employees Never Better Looked After

As you know, your president a long time since at one of our meetings took a decided stand with respect to what should be the attitude of the employers of labor towards the employees. And I am glad to say that the directors and other members of the Institute and the employers of labor generally who are connected with this industry have fully supported all that has been said and done to establish and maintain a position and a comprehensive work calculated to promote the best interests of the workingmen. It is true that we sometimes read in the newspapers criticisms which are unfavorable but which mis-

represent the facts. As a rule the newspapers are fair and considerate and mean to publish the truth and to do the right thing. But being compelled to rely upon information which is gathered from various sources, they are frequently imposed upon and do an injustice to those who are affected without intending to do so. We have been fortunate in having connected with our work editors of the principal trade journals, who have always been fair and accurate in their statements. Nevertheless, it is true that at times, by reason of misrepresentation made to some of the newspapers, and as a result of public addresses by men who were careless of their statements and who were not inclined to be fair, and whose efforts seemed to have been to excite a prejudice on the part of employees, some of the leaders in the steel industry have been accused of ill-treatment. But I make the assertion that in no line of industry, at any period in the history of the world in any country, was labor on the whole better treated in every respect than it is at the present time by the employers of labor in this great line of industrial activity.

Employers Have Met Their Responsibilities

I congratulate you that you have generally recognized your obligations and that you have measured up to your responsibilities, not because it paid you in dollars and cents, but more especially because in recognizing the spirit of co-operation, the feeling of fraternity, the feeling of affectionate regard which men occupying high positions are beginning to realize they must entertain in order to get the best results in life, you have from the abundance of the heart taken a position concerning these questions which is sound and just.

As has been said by some of our speakers at our banquets, we must all the time make it certain that those who happen to be under our control or subjected to our influence, and who are not sufficiently able to care for their own interests, must be protected by us to the fullest extent. And I hope and predict that this Institute will never exert any influence concerning this question which can be justly criticized. I think perhaps it is somewhat remarkable that in view of the fact that certain labor leaders, whose names I need not mention, have made most desperate efforts during the last few months and years to incite trouble, to bring about a feeling of discontent and to cause rupture between the employers of labor in your line of industry and the employees, they have generally failed in their efforts. And because of this these men, these so-called leaders, have more or less brought about a crusade and carried on a warfare which was directed against you and your interests. But you have at the present time a record and a reputation of which you may well be proud.

More Frequent Meetings

It has been proposed by some of the directors that we should endeavor to bring about more frequent meetings of the members of the Institute, that we should try to get a little closer together, that we should be in more frequent communication, and to that end should hold at least two meetings in the year. That is a subject which I think should be considered and perhaps decided at this meeting. Whatever may be the wishes of the members of the association who are not on the Board of Directors, the board will be very glad to carry out. We would like to make the Institute a home for all its members, and we would like to establish and maintain a relationship which shall keep us close to one another, so that so far as we have the right to do it we may protect one another against improper assaults of all kinds and descriptions from any quarter and with reference to any question in which we may be interested.

American Iron and Steel Association to Be Taken Over

It is also proposed to establish a bureau of statistics, and in that connection publish and distribute to the members a periodical which shall furnish information concerning the action of the Board of Directors and with reference to the trade generally in so far as the Institute has any jurisdiction or may be connected. While arrangements have not yet been completed, the subject matter is in charge of a committee, and I believe that committee will make some arrangement whereby the books and records and work of the American Iron and Steel Association,

which has been under the charge and management and has been so admirably conducted by Mr. Swank, may be turned over to the American Iron and Steel Institute. As you know, Mr. Swank is not in perfect health, and the labors which have been imposed upon him are somewhat onerous, and at different times he has suggested to some of the leading gentlemen connected with this industry that he be relieved of his work. And I hope some satisfactory arrangement will be made whereby the Institute may take up and carry on this work, if not as well as it has been carried on by Mr. Swank, yet satisfactorily to all who are connected with the association.

The Brussels Conference of 1911

I think I should refer to the meetings in Europe last summer. Delegates were selected by this Institute to represent it in meetings in Europe which were calculated to increase the feeling of friendship existing between European manufacturers and American manufacturers, as expressed so admirably by the large number of representatives of Europe who attended our annual meeting of 1910. The delegates were first entertained in London by members of the industry who are located in Great Britain. After that banquet the convention which had been called to meet in Brussels was held and was attended by leading representatives of the iron and steel industry from Great Britain, Germany, Belgium, France, Austria-Hungary, Italy, Spain and Russia. A banquet was given by the Belgians on the second day of the meeting. It is not an exaggeration to say that the gentlemen there controlled the iron and steel industry of all Europe. They were a splendid type of men. And the reception which they gave to your representatives on these three occasions was cordial and generous and unbounded in hospitality. The spirit shown by our European brethren was magnificent. In everything they did and in everything they said it was apparent that they fully appreciated the high position in this line of industry which you had reached and the disposition you had shown concerning the European manufacturers and their interests. And more than that, they extended to your delegates a welcome and expressed a desire to co-operate with you in carrying on in a decent and honorable way the best interests of all engaged in the trade. I could not use words of exaggeration in describing the friendly, cordial, hospitable, co-operative attitude and disposition on the part of these European gentlemen. And these men, I venture to say, may be called upon at any time by any of you to assist you in every possible way.

I ought to say that the representatives you sent to Europe to attend this great meeting in Brussels—leaving out, of course, your president—did nothing and said nothing at any of the meetings to discredit themselves or those whom they represented. I think they were recognized by the Europeans as men of the highest character and the greatest ability and the most splendid type of citizen that could be found anywhere engaged in any line of business.

The Old-Time Regime of Competition

I am justified in boasting somewhat of the American manufacturers of iron and steel. As you know, I came actively in connection with this business about fifteen years ago, although I had had some relations with it in one way or another for some few years previous. I do not feel qualified to speak of the old regime. My experience and acquaintanceship was not such as to justify me in undertaking to characterize any of the men or any of the methods in olden times; but I think I will not do any injustice if I say that the attitude, the disposition and the conduct of the manufacturers of iron and steel in earlier years in this country was more antagonistic, more calculated to engender a feeling of great animosity. Certainly some of the methods were ruthless and unrestrained, and injury was brought upon those who happened to be at times weaker financially or otherwise, by reason of this aggressiveness, which involved no moral wrong and certainly no legal wrong, but in its results seemed cruel. It had been built up and was being carried on upon the basis that every man's business was his individual affair and that every one had a legitimate right, so far as he violated no legal or moral principle, to even crush his competitor out of existence if necessary. If I supposed I had exaggerated the conditions I certainly would be the first

to apologize. I only mention them for the purpose of stating that the gentlemen who represented you last summer in Europe were all men with whom you would trust your whole business interests and your whole business fortunes, and the high character as well as the great financial and intellectual merit of these men was fully recognized by our European friends. These gentlemen stated repeatedly in private conversation, and some of them at the meetings to which I have referred, that they were perfectly willing to place their interests in charge of the American manufacturers if the American manufacturers would show a disposition to reciprocate.

To my mind it was a most remarkable gathering in Brussels. I doubt if any other such meeting, involving the welfare of any industrial department of life, was ever before held. There, in one room, were controlling representatives of the iron and steel industry of the entire world, and all perfectly willing, nay, anxious, to come together and remain together on a basis of friendly, open, mutual co-operation, which was calculated to advance the interests of all and to bring injury to none.

Why an International Association Was Not Formed

You may ask why no international association was organized in Brussels, for it was understood that the object of the meeting was to form such an association. And in connection with that question might be asked another question, as to why the manufacturers of iron and steel in this country are not at the present time co-operating as they have co-operated in the past. I recognize that this is a very delicate question. But I deal in frankness. There is no disposition on my part, and never has been so far as I have been connected with this branch of business, to deal in duplicity or to conceal even my motives. My attitude in that respect will never change. In my opinion co-operation on the part of the manufacturers, as it existed in this country from the time of the unfortunate and terrible financial distress of November, 1907, until the summer of 1911, was always in every respect above reproach and not deserving of unfavorable criticism. And what I have said concerning co-operation is equally true, in my opinion, of the proposed organization in Brussels by the manufacturers of iron and steel throughout the world.

Co-operation Will Yet Be Vindicated

I am firmly convinced that when the last word is said by the courts of highest authority we shall find that our position during all this time and the things which we have advocated can never be successfully attacked. Nevertheless, you will remember that one member, or possibly more than one member, of a certain Congressional committee during the month of June, 1911, criticized unfavorably our co-operation, and also criticized unfavorably the proposed organization of an international iron and steel institute in Brussels, and those criticisms were to a certain extent published by the newspapers of this country. I have no doubt there are people who honestly entertained the opinion that the laws of the country had been violated; or, if not, that the best interests of the public had not been promoted by your efforts. That being so, it has seemed proper to those who are more or less responsible as the highest officials of the larger corporations in this country to make certain there was no disposition on our part to antagonize or to defy public sentiment in any respect or to do anything which should be criticized by anyone in authority, until after all these questions shall have been carefully considered and finally determined. Not that any of these gentlemen have the slightest doubt in regard to the position which they have heretofore assumed, but because they believe it is always a mistake to defy or to ignore public sentiment; because they desire to occupy a position all the time which entitles them to the respect and the high regard of everyone who may be interested in their efforts.

No Government Objection to Co-operation

I think it should be remembered that prior to the month of June, 1911, no one representing the Government or any department of the Government, executive, judicial or legislative, had ever criticized or objected to anything the representatives of the iron and steel industry in this country had done or said concerning what we have termed co-

operation. And when it is remembered, also, that everything you did and said at all times had been made public and exposed to the consideration and criticism, if desired, of every one, I think it is most remarkable that the general public, so far as we knew, had approved our action; and yet for one reason or another many assumed an opposite view.

Business Conditions Will Be Better

I mention this subject particularly at this time because I want you to understand that I realize your business conditions during the last year have not been satisfactory. I know that many of you have sold your products at prices less than cost. I know that some of you must have had more or less difficulty in financing your obligations; but, gentlemen, I hope no one engaged in this line of industry will lose heart; I hope you will keep up your courage; I hope you will stand by your guns. Don't give up the ship. You are going to be prosperous in the future, as you have been in the past. Don't make up your mind that your competitor in business is desirous of engaging or continuing in a different competition than the competition following 1907, which was more satisfactory. Do not believe for a moment that your competitor is your enemy. Competition has always existed and will exist, and it is perfectly right that it should always exist without interruption. I believe in competition thoroughly; I believe the race should be won by the swiftest, that the greatest success should come to him who is the most earnest and active and persevering; but I do not believe in destructive competition, which means bitter, relentless, overbearing, tyrannical conduct, calculated to drive out the weak and allow only the strong to survive.

Success Will Come Eventually

And so, gentlemen, remember that in the maintenance of friendly relations, in carrying out our disposition to assist rather than to injure our competitors, in being frank and fair and honest with one another, we shall eventually succeed, because that is the right and the modern basis. When a thing is right it will ultimately and permanently succeed. I should feel very much distressed if I supposed for one moment anyone connected with the trade thought I personally would be a party to anything which would unjustly deprive my competitor of his rights or prevent him from succeeding in the conduct of his affairs to the extent he is entitled to succeed. So far as I am concerned, I do not believe in any secrecy; I think everything should be open and aboveboard; I think the public even should know what we are doing. I would not intentionally place myself in antagonism to the laws of the country or to public sentiment. I have no spirit of defiance.

I consider all these questions most important. And when we ascertain what our rights and obligations are, we must and will live fully up to them. But, on the other hand, in so far as we properly can, I hope the manufacturers of iron and steel will stand together, will occupy a position which is so high, so honorable, so generous, that it will compel everyone to recognize the rights of others to the same extent he insists upon his own rights.

So, gentlemen, if there are any who are present here, representatives of lines or of plants or of companies who are finding it very difficult to meet their obligations because of a basis of business which is unprofitable, I hope you will keep up your courage and stick by your property and devote your time and energies more particularly to preserving your business, until by some kind of government recognition, if not government regulation, you may be allowed to proceed on lines permitting you to work together, to co-operate and to build up your business and your interests in the future as you have in the past.

A Period of Transition

I should like to say just a few words concerning the attitude of the members of the Institute. We are passing through an age of peculiar conditions; we are in a transition period. Undoubtedly there is more or less throughout the world a spirit of unrest. This has perhaps been exaggerated, as all such things are exaggerated. But it is certain the peoples of the world are moving; it is impossible for people to remain inactive and to occupy positions which have long been occupied and which may not

be changed. In other words, we are progressive. Now I am not going to talk politics, but I will say that this word progressive is not dangerous. Simply because a man is called a progressive it does not mean he is a demagogue, a socialist, an anarchist or a fool. What we need and what we should stand for, in my opinion, is a conservative progress. If we will only look to both sides of all the questions which are being presented, and from whatever source they come, reasonably, fairly, without prejudice, and consider what is for the best interests of all concerned and what should be done in order to adapt ourselves, our business, our daily conduct to the changed and changing affairs of life; if we will recognize the interests of all with whom we come in contact; if we will be more generous; if we will lay aside our selfish disposition; if we will throw off our cloaks of self-righteousness; if we will bring ourselves to the position where we are willing to stop and look and listen and consider, and then determine what progress ought to be made in every direction in order to protect and advance the best interests of the entire public, we need have no fear of results and we need not be ashamed of our opinions or our actions.

Steel Manufacturers and Public Opinion

And so, gentlemen, I should like to see the members of this Institute occupy a position which recognizes the rights and interests and claims and criticisms of the public. I hope we shall never be disposed to defy or ignore the public interest or public criticisms. On the contrary, I hope we shall endeavor to profit by everything that may be said concerning us and concerning our affairs. I trust the members of the Institute may get and keep above and beyond the mere question of making money for ourselves; that as citizens of this great republic we may occupy a position and advocate principles which will advance the best interests of the country. Who is more desirous of seeing the principles prevail on which this country is established and maintained than the members of this Iron and Steel Institute? Is there a man in Washington who fills any office or represents any faction better qualified to advance or more interested in advancing the best interests of the country than you? I answer in the negative. Gentlemen, the time will come when the influence of the American Iron and Steel Institute for good will be fully recognized.

Technical and Business Sessions

Following President Gary's address, which was warmly applauded, the programme of papers was taken up. It is worth recording as an exception to what usually occurs at such meetings that the programme was adhered to without the slightest deviation. Every paper was read as scheduled and every participant in the discussions made his appointed contribution. The programme was so full that there was no time for discussion beyond that furnished by the persons selected in advance. At the morning session E. A. S. Clarke read a paper on "Contract Obligations," which was discussed by Willis L. King and James A. Farrell. Joseph G. Butler, Jr., contributed a paper on "Competition: Its Uses and Abuses," which was discussed by John A. Topping and Charles M. Schwab. A buffet lunch was served at the close of the morning session.

Afternoon Session

The programme was taken up again at 2 o'clock, Julian Kennedy, Pittsburgh, presenting a very interesting account of his visit to India in the fall of 1911 in connection with the starting up of the works of the Tata Iron & Steel Company at Kalimati, India. A description of these works from details furnished by Mr. Kennedy appeared in *The Iron Age* of April 11, 1912. William R. Walker, assistant to the president of the United States Steel Corporation, in charge of metallurgical investigations, read a paper on "Electric Furnaces," which was discussed by Theodore W. Robinson, Eugene B. Clark and Samuel T. Wellman. This with its discussion and the other papers and discussions presented at the meeting appear on other pages of this issue. Dr. Allerton S. Cushman read a paper on "The Corrosion of Steel and Its Prevention," which was illustrated by lantern slides. A discussion was read by Louis J. Campbell. John S. Unger followed with a paper reviewing "Metallurgical

Developments in the Manufacture of Iron and Steel," which was discussed by Dr. George B. Waterhouse, metallurgist of the Lacawanna Steel Company.

The suggestion that more frequent meetings of the Institute be held took shape at the close of the afternoon session in a resolution presented by James A. Campbell and unanimously adopted, recommending to the Board of Directors that a meeting similar to the annual meeting in May be held in October at such place as may be decided upon, the whole matter being referred to the Board of Directors, with power.

The Banquet Programme

The annual banquet was held in the Astor Gallery of the Waldorf-Astoria and was attended by about 225 members of the Institute. Judge Gary presided. The announced programme of after-dinner speaking included two addresses on welfare work, one on "Enforcement of Health Laws" by Dr. Thomas Darlington and the other on "Rendering Labor Safe" by Raynal C. Bolling, assistant general solicitor of the United States Steel Corporation. Dr. Darlington emphasized the obligation upon employers to safeguard the health of employees, particularly in communities built up by manufacturing companies. He said that a great part of the loss to employees and to the industry now caused by disease in such communities was preventable, and described with some detail the measures taken in recent years to improve sanitary conditions in workmen's homes and in camps and communities connected with iron and steel operations.

Mr. Bolling gave some idea of the expenditure of the Steel Corporation in sick benefits, accident compensation, sanitation and welfare work, pensions for employees and for special devices for the prevention of accidents. The total is close to \$5,000,000 a year, of which \$1,250,000 is devoted to sanitation and welfare work and \$750,000 to accident benefit. The annual pension payments are about \$700,000. The speaker estimated that the measures put in force in the past two or three years represent the saving from injury or death of 2000 men a year. The six years' work done in the Chicago plants of the Steel Corporation had made the South Works of the Illinois Steel Company the safest steel mill in the world. A Government investigator who had thoroughly gone into the matter was quoted as saying that the accident prevention work of the Steel Corporation was better than that of Germany. The speaker figured that the saving from accident cost, in compensation and otherwise, due to the work at the various plants, now amounts to about \$1,300,000 a year.

In the past year suit was brought in only 2-10 of 1 per cent. of the accident cases. Whereas in ordinary accident litigation only 30 or 40 per cent. of awarded damages goes to the injured, the records showed that last year 79 per cent. of the money expended by the Steel Corporation on account of accidents went to the injured men or their families. The speaker referred to the great unrest now prevailing in industry and to the transition period through which the country is passing. It sometimes seems, he said, as if the burden of proof rested with the advocate of the established order rather than with the agitator for change. In the opinion of the Attorney General the suit the Government has brought against the Steel Corporation is the most important ever contested in this country. The speaker emphasized the thought that every employer of a considerable number of men is helping to shape the future of industry and the condition of wage earners. He urged impressively upon those present the power that lay with them to minimize the differences which fortune had made in the condition of men of capital and those in their employ.

Iron Mining on the Mesaba Range

The use of moving pictures to illustrate iron mining operations is a distinct novelty, and this gave unusual interest to the address of William J. Olcott, president of the Oliver Iron Mining Company, on "Mining Operations on the Mesaba Range." The motion pictures showed how the churn drill is employed in exploration on the Mesaba range and then in turn brought vividly before the audience the operations involved in stripping, open pit mining, and mining by the milling system. The making up of ore

trains and their handling at upper lake docks and the final dropping of the ore into pockets and thence into the 600-ft. steamers of the Lakes were all shown with impressive realism. Mr. Olcott said that the productive portion of the Mesaba range extends a distance of 80 miles and includes 125 mines developed for operating. Shipments to date amount to 247,019,916 tons. The average depth of stripping so far removed on the Mesaba range is about 55 ft. and the maximum depth about 130 ft. From all properties there has been removed in stripping over 180,000,000 cubic yards. The amount required to be removed for the Panama Canal was 182,537,766 cubic yards. From open pit operations on the Mesaba range 158,455,874 tons of ore have been removed. If this were loaded into steel ore cars of 100,000 lb. capacity it would require 3,169,117 cars, which if put into one train would extend around the world at latitude 53 deg., a distance of 14,405 miles.

William B. Schiller, president of the National Tube Company, was called out by Judge Gary to speak on the present status of welfare work, and remarks were also made by Percival Roberts, a director of the Steel Corporation.

Points of interest in New York City were visited by some of the members on Saturday, special arrangements being made for these trips, which included an inspection of the New York Central terminal and the central electric plants of the Interborough Rapid Transit Company and the New York Edison Company.

Members in Attendance

Among the members who registered for the day sessions or were present at the banquet were the following:

Franklin E. Abbott, Horace J. Adams, Robert L. Ahles, Jay I. Andrews, August Ziesing, M. Cochran Armour, Alexander F. Banks, Mr. Buck, Henry H. Barbour, George Bartol, John G. Battelle, Horace A. Beale, Jr., Raynal C. Bolling, Henry P. Bope, Roland H. Boutwell, Lawrence F. Braine, Thomas J. Bray, William Breeden, Henry N. Brinsmade, John Penn Brock, Fayette Brown, Jr., Lowell H. Brown, Eugene J. Buffington, I. Townsend Burden, Jr., James A. Burden, Donald F. Bush, J. G. Butler, Jr., George Banks, James A. Campbell, Louis J. Campbell, Robert B. Carnahan, Jr.,

Clyde M. Carr, David B. Carse, John B. Carse, E. B. Clark, E. A. S. Clarke, Bertrand D. Coleman, Mr. Crispin, Edgar S. Cook, Edward B. Cook, Howard H. Cook, Theron L. Crane, George G. Crawford, William D. Crawford, Allerton S. Cushman, Otis H. Cutler, H. G. Dalton, Fred H. Daniels, Thomas Darlington, Thomas Devlin, Alva C. Dinkey, Mr. Dowling, J. T. Dillon, William H. Donner, L. L. Driggs, Edmund W. Dwight, Philip S. Dyer, George R. Early, J. H. Edwards, Joseph S. Elverson,

B. F. Fackenthal, Jr., James A. Farrell, W. E. Farrell, Edgar C. Felton, William J. Filbert, Alvin I. Findley, Henry S. Fleming, William U. Follansbee, George C. Foote, Arthur A. Fowler, Lewis W. Francis, Joseph W. Fuller, Jr.,

Elbert H. Gary, Dudley G. Gautier, James Gayley, Theodore A. Gessler, Peter J. Gordon, Eugene G. Grace,

Edward M. Hagar, Samuel Hale, Francis J. Hall, Charles Hart, Joshua H. Hatfield, August Heckscher, Henry W. Heedy, Harry E. Higgins, William T. Hildrup, Jr., Robert Hobson, George E. Holton, William S. Horner, Francis E. House, Otis E. Hovey, Octavus N. Hutchinson, John Hughes,

Ward W. Jacobs, Joseph W. Jeffrey, Gilbert H. Johnson, Charles T. Johnston, Harry R. Jones, Jonathan R. Jones, William L. Jones,

Frank G. Kennedy, Jr., Julian Kennedy, Thomas W. Kennedy, Severn P. Ker, David G. Kerr, Willis L. King, Fred. Krebs,

Robert P. Lamont, Edward Langenbach, E. G. Emil Larsson, George K. Leet, James Lippincott,

Charles MacVeagh, James T. McCleary, Thomas McDonald, William A. McGonagle, George F. McKay, William C. McMahon,

George G. McMurtry, Clinton S. Marshall, Samuel Mather, William G. Mather, Daniel B. Meacham, George Mesta, Charles L. Miller,

Leigh B. Morris, Edmund W. Mudge, Thomas Murray, E. A. Mudge,

L. F. Nagle, Benjamin Nicoll, Edwin N. Ohl, William J. Olcott, Rudolph Ortmann,

William P. Palmer, Eugene W. Pargny, Leonard Peckitt, John A. Penton, Ward B. Perley, Arthur C. Parsons, William S. Pilling,

Charles E. Pope, George A. Prendergast, Veryl Preston, Robert L. Parrish, Charles S. Price,

David Reeves, George L. Reis, John Reis, J. Leonard Replogle, John V. W. Reynders, Franklin B. Richards, Percival Roberts,

Merton C. Robbins, Frank A. Roberts, Alexander P. Robinson, C. Snelling Robinson, Theodore W. Robinson, Karl G. Roebbling,

William A. Rogers, William B. Schiller, Charles M. Schwab, Samuel B. Sheldon,

John M. Sias, William P. Siebert, James Sim, Arthur J. Singer, Francis C. Smink, Cameron C. Smith, Powell Stackhouse, John

Stambaugh, Edward B. Stearns, H. L. Stevens, Archibald A. Stevenson, James Stillman,

Thomas H. Taylor, Wade A. Taylor, William H. Taylor, Elmer M. Tewkesbury, Eugene P. Thomas, Roland D. Thomas, Leon

Thomas, William A. Thomas, D. P. Thompson, Alexis W. Thompson, John A. Topping, Richard Trimble,

John S. Unger, Felix A. Vogel, George M. Verity,

J. E. Wadsworth, E. C. Wallace, James C. Wallace, William R. Walker, George B. Waterhouse, Ralph C. Watrous, George W.

Watts, Richard Wayland-Smith, Ernest W. Weir, Andrew Wheeler, C. P. Wheeler, Hugh B. Wick, Ernest Wier, Theodore H. Wick-

wire, Theodore H. Wickwire, Jr., Frank A. Wilmot, Walter C. Witherbee, Frank S. Witherbee, Wilfred L. Wright, Walter Wood,

E. H. Worth, W. P. Worth, C. H. Zehnder, Edward M. Zehnder.

Contract Obligations in the Steel Trade*

How Existing Abuses May Be Remedied—Suggested Features of a Binding Contract—Wide Publicity for Extras

BY E. A. S. CLARKE†

At the meeting of this Institute held on October 14, 1910, Willis L. King, chairman of the Committee on Contract Obligations, presented a carefully prepared paper on this important subject, which was very fully discussed by Charles M. Schwab, John A. Topping, Charles S. Price, H. P. Bope, James A. Farrell and E. J. Buffington. Mr. King's paper and the discussion that followed set forth very clearly the existing situation, together with the disadvantages attending it, as well as the causes which brought about those conditions, and the remedies necessary to correct them. In fact, the whole subject was so well covered that there seems little left to say, except to urge again strongly that the evil be corrected. For the sake of convenience, however, I shall endeavor to state briefly the trouble, its causes and the necessary remedies:

How Abuses Have Grown Up

The average buyer of steel has for some years looked upon his contract as an option, the material to be taken if the prices remained satisfactory, but the entire contract to be repudiated if conditions were not favorable. This custom does not apply to all forms of steel, and not at all to raw materials entering into the manufacture of steel. Contracts covering the sale and purchase of ore, coal, coke, pig iron, and in most cases billets and sheet bars, are practically always strictly carried out.

The same is true in regard to steel rails, though in the case of this commodity the time of delivery is sometimes extended, if the purchaser can show satisfactory cause, into the following season. But cancellations of rail contracts are practically unknown. Evidently, in the case where the buyer regards his contract as a mere option, a situation arises under which the seller has a heavy tonnage of obligations which he may have to meet, but which the buyer will not take unless conditions are favorable to him. The seller, realizing this, and particularly if the market is advancing, deliberately contracts for the sale of more tonnage than it is possible for him to deliver. The result is dissatisfaction on the part of the buyer at not getting proper deliveries, so that he, in turn, contracts with several sellers for a total of far more than he can use, with the idea that out of the combined contracts he will be able to get the deliveries and amounts that he needs. The disadvantages of such a situation to both parties are so evident as to need no further explanation.

As to the causes of this unfortunate situation, the one which in my judgment is chiefly responsible is stated in the discussion by J. A. Farrell, and I quote from his remarks this sentence following his reference to "the overweening desire of salesmen to do all of the business in their territory": "For the purpose of making a good showing in the volume of sales and contracts, buyers, and particularly the large wholesale merchants, have not infrequently been induced, not to say inveigled, into

*A paper read at the New York meeting of the American Iron and Steel Institute, May, 1912.

†President Lackawanna Steel Company.

placing contracts covering as extended a period as possible, for tonnages which they may hope to sell, and in some instances which they can have no reasonable expectation of being able to sell." Many other reasons for the prevailing tendency to disregard contract obligations were given, but in the writer's judgment the above statement of Mr. Farrell covers the fundamental cause.

Suggested Remedies

For the correction of these conditions, Mr. Farrell's suggestion that the salesman's remuneration and chance of advancement be made to depend, not upon the volume of his sales and contracts, but upon the profits derived from the goods actually delivered to the buyers, is most excellent. Mr. Bope's suggestion of short-time contracts, no guarantee against decline, preventing the buyer from buying more than he requires for use in any given period, and an equal obligation put upon the seller not to sell more than he can deliver within that period, if properly carried out, would accomplish most of what is necessary; provided that the sales contract, as suggested by Mr. Price, contains the elements of mutuality and fairness; and particularly, as Mr. Buffington stated, if the seller gives proper heed to his obligations in respect of making deliveries in accordance with his contract.

It seems evident that the sellers of steel are themselves primarily responsible for the condition to which they object, and it seems equally evident that they are the ones to correct it. This they can do only by thoroughly believing that an evil exists which is worth correcting and by co-operating harmoniously to that end.

Following the printing and circulation among the members of the Institute of Mr. King's paper and the discussion of it, the Committee on Contract Obligations decided that one of the first steps necessary to a full reform was the adoption of a uniform sales contract—uniform, that is to say, in respect of certain fundamental conditions—and a draft of such a contract form was prepared and discussed. For various reasons no definite action was taken; but the writer, as a member of that committee, has never lost interest in the matter.

Our Contract Abuses Not Shared by Europe

Following a general discussion of the subject with some of the European manufacturers who attended the meeting of October, 1910, and after again meeting them at the Brussels Conference in 1911, he decided to investigate more thoroughly the situation and the customs prevailing among European steel manufacturers. The gentlemen with whom he has corresponded have replied most fully and frankly to all questions asked, have manifested great interest in the subject and have supplied the writer with valuable data and information.

The investigation shows that the laxity as regards contract obligations which prevails in this country is practically unknown in Europe, and that many of the remedies suggested for the correction of the evil here are in current use abroad. There are in practically every country in Europe certain general sales conditions which vary but slightly between countries and which govern all sales of steel. These fundamental conditions are always stated at the time of making quotations, so that the buyer understands clearly the conditions which will govern the execution of the contract, and there can be no question of some new condition arising after the contract has been signed. These general sales conditions which obtain in Europe seem to the writer eminently fair and reasonable, particularly when stated in advance of signing the sales contract.

What a Binding Contract Should Embody

A form of sales contract, uniform as to certain fundamental conditions, seems to the writer essential to the proper enforcement of contract obligations. Some of the fundamental conditions which he suggests should be embodied in such a contract are as follows:

1. The material should be sold for the buyer's use only, and not be re-sold unless first further manufactured. This would have to be modified in the case of sales to merchants or jobbers.

2. Stipulations as to quality and variations should be

clearly stated. In the writer's judgment, the best way is to sell the material subject to the seller's standard variations for rolling and shearing, but these should be stated in a list to be published by the seller.

3. Differentials and extras in the way of price should be clearly understood, and the seller should publish a similar list covering these items.

4. Even if prices are quoted at final destination, contract delivery should be f. o. b. cars at the seller's works, with freight allowed to destination, the delays and risks of transportation being borne by the buyer.

5. If the prices quoted include a freight charge, the same should be subject to adjustment in case of increase or decrease in the published freight rate.

6. Terms of payment and character of funds in which payment is to be made should be clearly stated, and the amount and terms of discount, if any, clearly set forth. It should be made clear that freight charges are to be paid in cash by the buyer, and that they are not subject to discount.

7. It should be clearly stated that shipments and deliveries under the contract are at all times subject to the approval of the seller's credit department, and that in case of doubt arising as to the buyer's responsibility further shipments may be suspended until satisfactory assurance as to responsibility is given.

8. Specifications in detail should be furnished in substantially equal monthly quantities not later than the 15th of the month preceding the month in which delivery is desired; all material to which the buyer is entitled under the contract to be specified at least thirty days prior to the expiration of the contract. Buyer's failure to furnish specifications as aforesaid to be treated, at seller's option and without notice to buyer, as a refusal to accept and receive the unspecified portion of the goods.

9. The seller should promptly acknowledge receipt of specifications and at the same time advise buyer of the date on which it is expected to begin deliveries against such specifications, and the approximate date at which it is expected to complete the same; such deliveries to begin as soon after receipt of specifications as condition of seller's mill and of its previous sales obligations will permit.

10. There should be a clause defining the seller's liability for non-performance, and the following is suggested as fair:

"The seller shall not be liable for non-performance of this contract in whole or in part, if such non-performance is the result of fires, strikes, differences with employees, casualties, delays in transportation, shortage of cars or other causes beyond the seller's reasonable control; nor shall these exemptions be limited or waived by any other terms of this contract, whether printed or written; but in the event of unavoidable delay due to fires, strikes or other causes beyond the control of the seller, the buyer may, subject to previously obtaining consent of the seller, cancel the portion of the goods not manufactured or in process of manufacture at the time his request to cancel reaches seller's works.

"The seller is hereby given the right to have any company in the United States furnish material of the same kind and quality at the same cost to the buyer, in whole or part performance of this contract; and it is agreed that shipments and billing of material by or in the name of such company, as well as any payments made to such company therefor, shall be as effective and binding as if made by or to the seller direct."

11. The seller's guarantee in regard to defective steel should be clearly stated, and the time and manner in which claims for shortages or other errors, deficiencies or imperfections must be made.

12. All tests by buyer for physical or chemical requirements, and all surface inspection should be made at seller's mills before shipment, and should be final.

13. There should be a statement that the contract is made and executed in the State in which the seller's works are located, so that in case of disputes the laws of that State shall govern.

14. There should be a statement that there are no understandings or agreements relative to the contract that are not fully expressed therein, and that no changes shall be made unless reduced to writing and signed by both parties.

Contracts drawn to embody the above conditions, particularly if they are made known to the buyer at the time the quotation is made, should leave little chance for dispute, and should be perfectly valid and enforceable; but they can be enforced only if the principal manufacturers of steel believe in so doing and insist upon their enforcement even at the risk of losing a customer. No mere form or set of conditions will make a contract binding unless the conditions are to be enforced, and one of the conditions which must be lived up to most scrupulously by the seller is that covering deliveries and shipments; and the seller must stand willing to be penalized if he does not make the deliveries agreed to, just as he expects to penalize the buyer for breach of any of his covenants. The advantage to the seller of a strict enforcement of contracts is so evident as hardly to require mention; and in the judgment of the writer equal benefits would accrue to the buyer, and both parties would eventually be far better satisfied.

More Publicity for Differentials and Extras

One custom among European steel manufacturers which has struck the writer as being of great value, is that of publishing very complete lists of differentials and extras, covering not only sizes and quality, but also the quantity of one size or section in an individual specification. From these the buyer can tell just what his material will cost him and is thus enabled to so design his work as to utilize the lowest priced material. The writer believes that a proper differential in price, for quantity of one size specified at one time, would prove a satisfactory solution to all concerned of the question whether large consumers are entitled to a better price than small consumers. Such a basis of differentials is logical because the extra price is charged on account of extra cost. In other words, the buyer, if he requires more expensive service, has to pay correspondingly for it. The writer believes that if a properly prepared schedule of differentials and extras for size, quality and quantity of individual specification were in force, the base price of steel could be considerably lower than under present conditions, without reducing the profits of the seller.

In conclusion the writer suggests—if it be proper, which he assumes it is—that the American Iron and Steel Institute through its directors instruct the Committee on Contract Obligations to prepare such a list of differentials and extras, together with a standard form of sales contract, the same to become, when finally approved by its directors, the recommended contract form and list of extras of the Institute. The writer does not believe it to be a function of the Institute to attempt to prescribe any such forms, but believes that, just as the American Railway Engineering Association, whose membership includes practically all the railroads of the country, has a recommended form of specification for steel rails, so the Institute might well have a recommended list of extras and form of sales contract to be adopted and used by such of its members as may feel inclined to do so.

[In connection with the reading of his paper Mr. Clarke quoted the following from the Ironmonger, London, Eng., which he considered a tribute to the fairness of the Stahlwerks Verband, its steady influence upon the market and its adherence to contracts in a way that might well be imitated in the United States:

From the point of view of the manufacturer, there may be many arguments in favor of the elimination of the merchant, but the putting into practice of this policy led to a good deal of resentment among British merchants who had formerly dealt freely in German material. The consumers, however, seem to be well satisfied with the way in which the big German organization has handled its export business, for they have found that they can rely with confidence upon their specifications being dealt with in regular rotation and irrespective of the contract price, in addition to which the policy of the Verband has been consistently directed to the steadying of the markets. When trade was bad there has been no slaughtering of rates, as in the old days, and there has been no undue rushing up of prices when the needs of buyers became over-pressing. Further, the Verband agents have set their faces resolutely against the practice frequently followed elsewhere of snatching orders for prompt delivery at premiums at the expense of consumers with running contracts, and thereby imperiling deliveries against the specifications of the latter.]

Discussion

By Willis L. King, Vice-President Jones & Laughlin Steel Company

I have had hanging in my office for some years a framed motto in large and bold letters—"A CONTRACT IS A CONTRACT"—furnished me through the courtesy of E. M. Hager, president of the Universal Portland Cement Com-

pany, who, having kept the faith himself, believes in reciprocity.

This motto has been the cause of much good natured raillery and fun at my expense, but I am content, because it has enabled me to discuss this subject with many hundreds of buyers under favorable conditions. I have yet to find one who would admit any disposition to question the mutual responsibility of a contract of purchase; but the consensus of opinion was that it had become a custom to rewrite contracts when unfavorable to the buyer, and they must have the same advantage as their neighbors. Quite a few expressed the opinion that sudden and violent fluctuations in market prices were not to their advantage, and that when steel products sell at unprofitable prices their profits are correspondingly reduced. And this is equally true of the ultimate consumer when purchasing power is diminished in proportion as the steel industry becomes unprofitable.

NO ASSURANCE TO EITHER SIDE UNDER PRESENT CONDITIONS

We may speculate indefinitely as to the cause, but the fact remains that no manufacturer can sell his product intelligently and no buyer can depend absolutely upon deliveries under the present loose and unbusinesslike manner of treating contracts. No manufacturer can strike a true balance between his obligations and his production, and he must, therefore, be undersold or oversold, neither of which is desirable. In the one condition he feels compelled to seek new business at the expense of profit and to the injury of his fellow manufacturers, and in the other he must disappoint his customers in delivery. It is my firm belief that this uncertainty is mainly responsible for the extreme fluctuations in prices in the recent past, and that it will continue injuriously to affect values until a contract is regarded as binding on both sellers and buyers alike.

THERE MUST BE THOROUGH UNDERSTANDING OF CONTRACT TERMS

Having proven our case, as I hope, that contract obligations should be respected, and that the buyer is equally benefited, what ought to be done to bring it about? In Mr. Clarke's admirable paper, he suggests the first step necessary in the correction of this evil; namely, a complete and mutual understanding before the fact, of all the terms and conditions, including extras for sizes, quality and quantity, all of which can best be obtained through a uniform contract equitable to both parties.

I hope that the committee of the Institute can evolve such a contract for submission to its members and to the trade generally, for I am inclined to think that a discussion of the matter with broadminded buyers, who in my opinion are equally interested, would assist materially in producing a contract so fair and equitable that all will gladly adopt it. But something more is necessary. The buyer should purchase only what he can properly use, and the seller must arrange to make the stipulated deliveries; for speculative buying deceives the manufacturer as to his obligations and is a hardship to the legitimate buyer as well.

A STABLE MARKET IMPORTANT

Long time contracts, except for specific work, should be avoided because they are generally more or less speculative.

While the moral fiber of each party to a contract is the best guarantee of its final and equitable conclusion, I am not unmindful that sudden and extreme changes in the market prices may work serious hardship to the conscientious buyer, perhaps beyond his financial ability; and the advantage, under such conditions, of a reasonably stable and equitable market price becomes very apparent. In fact, after careful consideration of the question of contract obligations, I have come to the conclusion that the real and lasting solution of this trouble lies in a stable market, varying of course with the cost, but allowing a fair return to the manufacturer on his investment, and at the same time so reasonable to the public that consumption will not be retarded.

This is the great economic question before the public, the lawmakers and the courts to-day. I do not feel that this is the time or place to discuss it, but I have a firm conviction that in due time it can and will be worked out to the best interest of all concerned.

I agree with Mr. Clarke that only concerted action can accomplish the desired result, and that the committee of the Institute now in charge of this matter should continue

its efforts to secure a contract uniform in fundamental conditions and entirely fair to both parties to the contract in its details.

Meanwhile, the buyers having contracts can rest satisfied that the increased demand and advance in market price now so apparent will in no way be allowed to affect the contract obligations of the seller.

By James A. Farrell, President United States Steel Corporation

The paper presented by Mr. Clarke and the previous discussions of this subject have covered in a comprehensive way the phases that are pertinent to the obligations of both buyers and sellers. I have no reason to change the opinion expressed at the meeting of this Institute in October, 1910, that reasonable control of salesmen's efforts to secure from buyers the maximum tonnage they are willing to purchase will, in itself, be a partly effective means of correcting this recognized evil.

I believe that it is possible to bring about a state of mind in commercial circles in this country, as it has been abroad, which will recognize that a contract is a contract, and that no man, either buyer or seller, who is financially responsible, can afford to repudiate an obligation that has been entered into in good faith by both parties thereto, simply for the reason that at the time specifications are due it is advantageous to the seller to make shipment or to the buyer to accept delivery.

CONTRACTS AN INSURANCE TO THE BUYER

Contracts for future delivery of material are in a certain sense a means of insurance accorded by custom from sellers to regular consumers, to enable buyers to make provision against the future and resell or consume the material at a profit. It is essential that merchants and consumers should be able to calculate precisely the cost of material, to enable them to manufacture and sell over a fixed period. But this period should be a reasonable one and should be limited, so far as possible, in the case of the merchant trade for resale, to three months from date of contract, and in the case of manufacturing consumers to six months.

On the theory that these contracts provide an insurance to the buyer against the possibility of his being unable to obtain continuous supplies in accordance with the requirements of his trade, it should be considered distinctly a breach of business ethics that any buyer should take out such insurance beyond his capacity, or that any seller should contract to supply material beyond the buyer's capacity to consume. It is a wise provision of insurance companies that they will not grant a man life or accident insurance beyond his recognized ability to carry it, nor fire or marine insurance beyond the value of the goods insured, plus a reasonable margin for loss during replacement. It is a reasonable business precaution, therefore, that sellers should ascertain the maximum consumption of their customers and should decline to sell beyond that consuming ability, and should discourage their salesmen from soliciting business from customers who have already contracted for their total requirements. In the event of the manufacturer's inability to deliver in season, provided specifications have been supplied by the purchaser in ample time, in accordance with contract provisions, exceptions should of course be made to this rule.

Reasonable adjustment of a contract and the deliveries called for should, of course, be made under extraordinary conditions, such as strikes, floods, accidents, and other causes entirely beyond the control of the buyer or the seller; otherwise, contracts should be so drawn as to be entirely enforceable. Under such conditions, no careful buyer would overbuy, and no careful manufacturer would oversell. This would help to bring about an economic condition greatly to be desired. During the early stages of the enforcement of such contracts, there would be more or less contention. But in the end both the buyer and the seller would wonder why they had not brought about such conditions earlier.

NO GUARANTEES AGAINST DECLINES

It is self-evident that in insisting upon buyers carrying out their contract obligations with the same due regard as they expect from sellers, there should be no guarantees against declines. But if any modification of this rule should at any time be permitted, particularly if any deviation

is made in contracting for longer than the recognized period, it should be solely against seller's own decline. And there should be a reasonably compensating provision to the effect that if prices should subsequently advance contract prices should be correspondingly adjusted. It is a distinctly unbusinesslike proceeding to permit buyers to reap any advantage that may accrue from a reduction in the contract price without allowing sellers a similar advantage when there is an advance in price. If contracts are to be made on a fluctuating basis, they should provide for advances during the life of the contract as well as for declines. In other words, the contract should be in all respects mutual.

At the time of the formation of the United States Steel Products Company it was found necessary to formulate general conditions of sale. These conditions were made necessary by reason of many practices in vogue in export markets. A copy of these conditions of sale will be printed with these remarks. It may be said that they are acceptable to buyers throughout the world, as an ordinary matter of course, because they clearly define the obligations of both seller and buyer.

UNIFORM SALES CONTRACT

Mr. Clarke's suggestion of a uniform sales contract is most excellent. The stipulations in such contracts as have been devised by foreign manufacturers and by a number of American manufacturers need only be those which conform to authenticated legal decisions and which are fair alike to buyers and sellers. If material is sold on contract forms which clearly indicate the obligations of both buyers and sellers, even though the provisions must necessarily be of considerable length, they will form a recognized standard, serviceable alike to both buyers and sellers. And they can in turn be made effective between the buyers and their clients, obviating the possibility of misunderstandings and the necessity for legal actions.

It will be a benefit alike to sellers and buyers when the obligations of each are recognized. I heartily endorse, therefore, the suggestion not only of uniform contracts but uniform quotation sheets, so that, prior to the signing of a contract and during the progress of the negotiations, buyers may know precisely their own obligations in the event of entering into a contract and can in turn make similar obligations binding on those to whom they sell.

The question of the integrity of the contract prices is as important, from the standpoint of both producers and consumers, as any other obligation between them. And if the Committee on Contract Obligations should compile a sales contract form and a quotation form containing clearly defined provisions, equally fair to buyers and sellers and in accordance with recognized legal interpretations, there is no doubt that sellers and buyers alike would cooperate in living up to its terms. It has been found in practice that where the obligations of both buyers and sellers are clearly defined and mutually understood, it is a source of equal satisfaction to the buyer and his client, for in our business the buyer is generally himself a seller to others, who in turn distribute the material in some manufactured form.

The Deforest Sheet & Tin Plate Company, Niles, Ohio, has well under way new extensions and additions to its plant, increasing the capacity of the rolling mill department 70 per cent. and of the galvanizing and dipping department over 100 per cent. The new additions include an electrical generating plant of low pressure turbo-generator type, four new finishing mills and furnaces for them in the hot mill department and a 30-ton traveling crane. The Lohmannizing and galvanizing equipment will be located in a new building, 90 x 300 ft. The improvements and extensions involve an additional investment of \$200,000.

The Crane & Engineering Company, Columbus, Ohio, has been formed to take over the property of the Case Crane Company of that city which, for about a year, has been in the hands of the courts and has been operated by J. M. Riley as receiver. The new company is organized with a capital stock of \$1,000, which, it is stated, will later be increased to \$550,000. The plan of reorganization has been assented to by about 90 per cent. of the creditors. It is announced that Paul T. Norton, one of the incorporators, will be president and general manager of the new company.

Competition—Its Uses and Abuses*

A Discussion of the Subject in its Broader Sense of Rivalry in Quality of Output and in Economies of Production

—BY JOSEPH G. BUTLER, JR., †—

There is an old adage, which has been dinned into my ears from my earliest recollection down to the present time: "Competition is the life of trade." I used to think—we all used to think—that this meant competition in selling prices, and in nothing else. It was very difficult to get away from the idea that "competition is the life of trade" meant anything else but with reference to selling prices. Now, what else could it mean?

Well, the world moves. When I first engaged in the manufacture of pig iron—away back in the late fifties—such a thing as an analysis of pig iron was not thought of. Pig iron was just pig iron. It was made for one specific purpose or another, and for a given purpose there were only two kinds: if it worked, it was good iron; if it didn't work, it was bad iron. By and by, however, we began to analyze the pig iron, and then we began to learn very rapidly how to improve it. I remember, incidentally, when we first started in the analyzing business in real dead earnest at Brier Hill. This was in the eighties. For certain purposes foundries would not use anything but imported Scotch pig iron. We solved this problem by sending out and getting samples of all the well-known brands of Scotch pig iron and had them thoroughly analyzed. We then pursued the matter further by an analysis and proper combination of ores, and it was not very long until we were making the American Scotch, which was equal to the imported.

In recent years we have begun to analyze this matter of competition, and a great many of us have come to the conclusion, by analysis, that competition covers a great many more things than simply naming the lowest selling prices. Let me give you an illustration: A large steel company, not many years ago, whose board of directors found that its administrative expenses were several times as large as those of another steel company, which nevertheless was efficiently managed, instituted reforms and effected important economies, so that the administrative expense was greatly reduced, thus reducing the cost of steel products. Now, that was competition. The first company was competing with the second to see which could develop the lowest administrative expense. I know of many other instances of a similar nature, and I could multiply indefinitely instances of competition which was not competition in selling prices, but there is no need.

Competition in the Reduction of Cost

Now, let us examine and analyze this adage, "Competition is the life of trade." Assume, just for the sake of argument, and for that reason only, that it really means nothing but competition in selling prices, each seller trying to name the lowest figure. How will that benefit trade? First, by tending to increase the consumption, for the lower the price, other things being equal, the more will be consumed. Second, by placing the seller under the necessity of producing cheaply, for the more cheaply he can produce, the more vigorously he can compete. Admitting, however, that price competition tends to lower prices, it does not follow that it is the only means of lowering prices. We have had in the United States, and still have, many great patent monopolies, men making goods in which there was no price competition, and yet as a rule these men have striven to reduce prices in order to increase consumption, for enlightened self-interest showed them that the aggregate profits were larger with a large output and moderate profits, than with a small output and large profits per unit. As to price competition furnishing an incentive to the producer to reduce the cost of production, there may have been a time when that stimulus was greatly needed; when men would not think unless they were forced to think, but that is not the case to-day. Everywhere, men are think-

ing all the time, trying to reduce the costs of production. They do it in the industries which are subject to sharp competition in prices, and they do it in cases where they are not subject to sharp price competition. Take for example, the underlying companies of the United States Steel Corporation. The competition among the officials and managers of these companies, is strenuous in the matter of reducing costs, and in the matter of greater efficiency. The same is true of the Independent companies, both large and small. There is much competition going on among the different steel companies to see how the number of accidents can be minimized, by improving modern safeguards. I could go on indefinitely with illustrations of this kind.

I insist, therefore, upon taking a broad view of this word "competition." In a newer and larger sense it really does constitute the life of trade, but not simply in the sense of price competition; in the sense rather of rivalry at all points—in developing new markets, in improving the quality of the goods and adapting them better to the uses for which they are intended and in reducing the cost of production and distribution.

The Excesses of Competition

I am reminded, however, that the subject assigned to me was "Competition, Its Uses and Abuses." Under the broad definition of competition which I have tried to develop I find that I have perhaps said enough already as to the uses. As to the possible abuses, I wish only to remind you that a wise thinker once remarked that many of our vices are really virtues carried to excess, and I can apply that here. When competition in reducing the cost of production is carried to the extent of overworking employees, or depreciating the quality of the goods made, it is a virtue carried to excess, and becomes a vice. The rivalry should be carried on at all points, in endeavoring to give the workmen the best conditions possible and in endeavoring to make the quality as high as possible.

Now, while we do have these various descriptions of competition in business, there is no doubt that competition in selling is a very important feature, and pursuing this method of analysis, I want to emphasize the fact that competing in price is only one of several means of competing in selling. One can compete in quality, in punctuality in delivery, in affording opportunity for inspection, in regularity of service, in remembering the customer's requirements from one transaction to the next, and so on.

Personal friendship counts for much in competition—often used and seldom abused. Generally speaking, the customer who has bought from a particular seller through motives of friendship is the one who is best satisfied. He had the confidence in his friend when he placed the order, and he is likely to have confidence in the goods when they are delivered. If the order had been secured through a cut in prices he would be fearful lest the quality had also been cut.

Competition That Tends to Monopoly

We started out with competition in general, and found by analysis that competition in selling was only one form of competition in business. Then we found that competition in prices is only one form of competition in selling. I want to proceed just one step farther, and analyze competition in prices. All price competition is not of the same nature. There is a price competition which is used only for the sake of securing a given order, because that particular order is needed. There is another form of price competition which is in a separate class and stands all by itself, which our good friend Judge Gary has brought to our attention from time to time—it is the old "destructive competition," which Judge Gary and others have tried to avoid; when a seller reduces prices, not for the sake of securing a particular order, but for the definite purpose

*A paper read at the New York meeting of the American Iron and Steel Institute, May, 1912.

†Vice-president Brier Hill Steel Company, Youngstown, Ohio.

of bringing prices to so low a level that his rival cannot live and is forced out of the field. This form of destructive competition can do no possible good to society; it tends inevitably towards monopoly. "To the victor belong the spoils"; and the seller who indulges in destructive competition no doubt has clearly in mind the harvest he intends to reap in advanced prices as soon as he has destroyed his rival. As we are endeavoring to abolish war between nations, so we should strive just as earnestly to abolish this form of industrial warfare.

It is human nature to strive and indulge in rivalry, and as we realize more, year by year, that we can indulge in competition, in rivalry, without trying to destroy our rivals, so we shall grow better, and aid in the world's advancement, without resigning that inborn desire which we have to do something better than we have done, or than others can do.

Discussion

By John A. Topping, Chairman Republic Iron & Steel Company

Colonel Butler's analysis of "Competition, its Uses and Abuses," is both illuminating and suggestive. He has demonstrated, I think, that he is a true progressive and not a stand-patter. Literally, competition of course means not only contest and rivalry, but emulation, and should not mean, as generally understood, a struggle for existence. Progressively applied, it can be made to mean rivalry for good rather than for evil. Our mistake has been, as Colonel Butler stated, in considering competition as an influence of destruction rather than as an influence of construction by emulating good practice and methods. Plutarch says: "To make no mistake is not in the power of man, but from their errors and mistakes the wise and good learn wisdom for the future."

EXCHANGE OF INFORMATION BY BAR MANUFACTURERS

Colonel Butler's thought as to the uses of competition occurred to me several months ago, and with a view to making effective emulation as a stimulant to greater endeavor, I suggested to a number of the so-called independent rivals of the our company that we arrange for a comparison of selling prices and provide for an exchange of records of steel bar shipments for January, February, March and April. I was not surprised to find rather too wide a variation in prices secured for these products in common markets to suggest there was equal efficiency in salesmen, making due allowance for other factors of price influence. The effect of competition when applied in this manner of course should be to stimulate the low seller to obtain better prices and to build up rather than tear down values.

For the past year I have also exchanged with some of our competitors selling costs and general expense, with a view to thus stimulating by competition greater efficiency and economy of management.

RIVALRY IN ADVANCEMENT, WHAT IS WANTED

Franklin says: "If you do what you should not, you must bear what you would not." If we follow the Franklin maximum we should avoid the abuses of competition and employ the uses of competition. The abuses of competition may be considered to mean a war of extermination and a struggle for existence. The uses of competition have not, as Colonel Butler states, been properly recognized, and in the brief space of time allotted me for discussion I think it can be better employed by emphasizing the uses of competition as a progressive force rather than multiplying the abuses of competition. In other words, what is desired, in my opinion, is to apply rivalry for our own advancement. This feature of competition is being more generally recognized today than ever before, as is evidenced by prizes offered by leading periodicals for most practical articles on conservation of life, health and sanitation. Agriculture is being stimulated by rivalry in soil reclamation and fertilization through the formation of corn clubs, cotton clubs, tobacco clubs, through suitable offerings of prizes in these contests. Manufacturers, recognizing this feature of stimulation by emulation, are paying bonuses and profit sharing for better methods and practice, as well as for labor and life-saving devices. Would it not be to our advantage to extend the uses of competition for our own collective advancement by employing more broadly than we have the parallel column of operating results attained, in a manner similar to that

employed by each of us individually, as a stimulant to our operating and selling forces?

In conclusion, I offer the suggestion that competition be applied in a co-operative sense—that monthly comparisons be made of such vital statistics as

General expense and management.

Average monthly shipping prices.

Employers' liability losses.

Production statistics properly detailed.

In this manner I believe competition can be made the life of trade. I need but remind you that we are living in a period of splendid achievement; that the power of Niagara has been harnessed; heavier-than-air machines have crossed our Continent; wireless telegraphy keeps us in touch with the ships that sail the distant seas; the Atlantic and Pacific oceans will soon mix their waters through the great ditch that splits the hills of Panama; the map of the world has been practically completed by the great explorers, Peary and Amundsen; the dark continent of Africa has been opened up to civilization—all of which is a record of recent accomplishment and is largely a result of the influence of competition. Should not we, therefore, bend our energies and intelligence to direct this power of competition for the well being of our labor and capital and to the enrichment and power of this glorious country of ours?

By Charles M. Schwab, President Bethlehem Steel Corporation

A state of affairs has grown up in the steel business in recent years with which we are all thoroughly familiar—a condition so different from that which existed in the days of destructive competition as to make that old policy out of date and not modern. There were days in this business when, by reason of excellence of plant and management, one firm had decided advantages over another firm in the cost of production. Today the great underlying principles in the manufacture of steel are so well understood and are so universally practiced by all the companies engaged in the business that the difference in the cost of manufacture has become very small, so small that destructive competition cannot now be safely practiced. We have advanced in manufacturing, we have advanced in our methods of doing business, we have advanced in the greatness of capital for doing business, and we must advance, as the next necessary step, in the method of selling our goods. We must avoid this destructive competition.

Mr. Butler rather shied at the subject, it seems to me, when he said that there are other methods of competing. There are; but they are not the methods that we think most about at our works. We are usually thinking of how we can get the orders and get them at the best possible prices. But, believe me, I am thoroughly convinced that for the success of this great industry of ours we must pursue, as the fundamental step, the course that Judge Gary so well inaugurated a few years ago. There will be difficulties in the way, but these difficulties must be surmounted. It is my belief that whatever may be the attack of the law or of agitation in the public press the attack cannot finally prevail, because it strikes at the root of the greatest economy in the building up of an industry. And whenever the just foundation of this policy is attacked by popular sentiment or by radical legislation the attack must and will fail. And I predict for this and all other great industries of similar character just as great advancement in the future in the method of disposing of product as they have had in the past in the manufacture of product.

Joseph Tracy and Henry F. Donaldson have associated themselves as automobile engineers to undertake consultation, research and development work, design and construction, laboratory and road tests, and have removed the office which Mr. Tracy has maintained for several years at 116 West Thirty-ninth street to 1786 Broadway, corner Fifty-eighth street, New York City. The testing laboratory in New Jersey, near New York City, will be maintained as heretofore and its facilities increased by additional equipment.

The Duncan Forge Company, Toledo, Ohio, has acquired the plant of the Vulcan Iron Works, Toledo, and the Bellefontaine Foundry & Machine Company, Bellefontaine, Ohio. The equipment of the two plants will be moved to the plant of the Duncan Company.

The Electric Furnace and High-Grade Steel*

Good Results Thus Far with Rails, of
Which 5,600 Tons Are in Service—
Complete Deoxidation Is Made Possible

BY WILLIAM R. WALKER †

In the manufacture of steel by either the Bessemer or open-hearth process, it is very difficult to remove the last traces of oxygen. In the basic Bessemer process, the over-blown metal, which is an extreme case of oxidation, contains only 0.06 per cent. of oxygen. Oxygen in combination with carbon (carbon monoxide), silicon, iron, aluminum and manganese, and also the combinations of silicates with these oxides, are very deleterious in steel.

My investigations lead me to believe that in the manufacture of steel for the so-called heavy products and steel that is produced in large quantities, a combination of either the acid or basic Bessemer converter and the electric furnace will take a very prominent place. With this combination it is possible to produce steel extremely low in oxygen and other impurities at a cost that will not be prohibitive.

At the present time there are over 70 electric furnaces of various types producing electric steel in Europe and America. These range in capacity from 1 to 15 tons. There is now under construction in Germany a furnace of 25 tons capacity. A number of these furnaces are competing successfully with crucibles in the manufacture of very high-grade steel.

Generally speaking electric furnaces may be divided into two groups:

1. Induction furnaces, in which the heat is supplied by a current induced in the bath.
2. Arc furnaces, in which the arc is struck, either between an electrode and the metal in the bath, or between two or more electrodes so as to heat the metal only by radiation from the arc.

Refining Methods with the Electric Furnace

In operating the electric furnace at the present time, the most prominent methods or combinations are as follows:

1. Oxidation of silicon, carbon and manganese in an acid-lined Bessemer converter and removing the phosphorus in the basic-lined electric furnace with an oxidizing slag and then recarburizing and with the aid of manganese and carbon and a new reducing slag removing oxygen and sulphur and dead melting as in the crucible process.
2. Removal of silicon, carbon, manganese and phosphorus in a basic-lined Bessemer converter and further removing phosphorus (if desired) in the basic-lined electric furnace with an oxidizing slag, and then with the aid of manganese and carbon and a new reducing slag removing oxygen and sulphur and dead melting as in the crucible process.
3. Removal of silicon, carbon, manganese and phosphorus in the basic open-hearth furnace and then recarburizing, and in the basic-lined electric furnace with the aid of manganese and carbon and a new reducing slag removing oxygen and sulphur, and dead melting as in the crucible process.
4. Melting of cold scrap of inferior quality in a basic lined electric furnace; removing phosphorus with an oxidizing slag and then recarburizing and with the aid of manganese and carbon and with a new reducing slag removing oxygen and sulphur and dead melting as in the crucible process.
5. Melting high grade materials in the electric furnace and dead melting as in the crucible process.

The phosphorus is removed in the basic electric furnace in the same manner as in the basic open hearth furnace—that is, by the use of lime and oxide of iron—and the resulting slag containing the phosphorus is removed and a new slag formed consisting of burnt lime and fluorspar; and when the slag is melted, coke dust is added, which,

coming in contact with the lime in the slag and the electric arc, produces carbide of calcium. The free carbon and possibly the carbide of calcium in the slag, with the aid of carbon and manganese in the bath, eliminates the oxygen from the steel.

Advantages of Electric Refining

As compared with the Bessemer and basic open hearth processes, the electric has the following advantages:

1. The more complete removal of oxygen.
2. The absence of oxides caused by the additions, such as silicon, manganese, etc.
3. The production of electric steel ingots of 8 tons in weight and smaller that are practically free from segregation.
4. Reduction of sulphur to 0.005 per cent., if desired.
5. Reduction of phosphorus to 0.005 per cent., as in the basic open hearth process, but with the complete removal of oxygen.

As evidence of the reducing properties of the slag in the basic electric furnace, it has been found that if oxide of manganese and oxide of iron are thrown on the molten slag, the oxides are reduced to the metallic state and the reduced metal goes into the bath. Blown metal from the acid Bessemer converter, containing only 0.10 to 0.20 per cent. manganese, has been completely deoxidized in the electric furnace without addition of manganese or aluminum, the usual amount of silicon being added in the steel ladle. Rails made from this steel are now in service. The composition of one heat of this steel is as follows:

	Per cent.
Carbon .....	.55
Manganese .....	.13
Sulphur .....	.017
Silicon .....	.19
Phosphorus .....	.022

These rails are comparatively soft, but are showing superior wearing qualities compared with the Bessemer rails in the same track and under the same service conditions.

Electric steel ingots crack much less in rolling than either Bessemer or basic open hearth steel. Cold electric steel ingots when heated and rolled into rails roll extremely well.

Electric Steel Rails May Be Softer

At the present time there are approximately 5,600 tons of standard electric steel rails in service in the United States. These rails have been in the track about two years. During the past winter some of these rails have been subjected to very low temperatures—in some cases as low as 52 deg. below zero, Fahr., and are being exposed to all the possible conditions of severe service. It is too early to say much about the wearing qualities of these rails, but from present indications it would appear that rails made by the basic electric process can be made somewhat softer than by either the Bessemer or basic open hearth process and show highly satisfactory wearing qualities. Up to the present time we have not heard of any basic electric rails in use in this country being broken in service.

For experimental purposes I have had made a small tonnage of electric steel rails, which have varied in analysis as follows:

	Per cent.
Carbon	0.50 to 0.75
Manganese	0.13 to 0.80
Silicon	0.10 to 0.40
Phosphorus	0.02 to 0.06

On account of the wide variation in the chemical composition of this steel it would in a paper of this nature and with the limited time at my disposal be difficult, without going into considerable detail, to discuss the physical properties of these rails. It might be stated, however, that electric steel of a given tensile strength has a slightly greater amount of elongation than basic open hearth steel

*A paper read at the New York meeting of the American Iron and Steel Institute, May, 1912.

†United States Steel Corporation, New York.

and that electric steel is somewhat denser than basic open hearth or Bessemer steel. With the electric furnace it is possible to produce steel which when magnified 1000 diameters shows no oxides or slag enclosures.

As high grade electric steel can be produced at a lower cost than crucible steel, there has been a gradual increase in the production of electric steel for certain purposes where crucible steel was formerly employed and where it has been demonstrated electric steel can be successfully used. This increased production has not been so marked where the object has been the improvement of steel entering into products manufactured in large quantities where the expense involved for experimental work is very great and where of necessity it takes several years to demonstrate if rails and other products made by the electric process are superior to those made by either the Bessemer or open hearth process. From present indications it would seem probable that there will be a decided increase in the production of electric steel for these products in the near future.

Discussion

By T. W. Robinson, Vice-President Illinois Steel Company

Three years ago the 15-ton basic-lined Heroult furnace erected at the South Chicago works of the Illinois Steel Company made its first heat. At that time it was the largest electric furnace in existence, and I know of none of greater capacity that has as yet been put into operation, although I understand there are several 20 or 25-ton furnaces in Europe now in process of construction.

NEW PROBLEMS WITH LARGE ELECTRIC FURNACES

The application of electricity to the manufacture of steel is, commercially speaking, a new process and the installation at South Chicago was a new adaptation of this new process. Our purpose was to demonstrate whether it was feasible to operate successfully a large electric furnace and make electric steel in large tonnages. At the time the South Chicago furnace was started the electric furnaces used in the manufacture of steel here and abroad were small, running from a ton or less to five tons in capacity. The aim in their development was largely to find a cheaper process than the crucible process. Our aim was to command a superior steel and if possible at a cost that would permit of its use in such products as rails. Our problems, mechanical, metallurgical and otherwise, proved many, and our experience soon demonstrated that the conditions surrounding the successful operation of a large electric furnace were in many respects entirely different from those involved in the use of smaller units. In illustration, the demands of a 15-ton electric furnace proved to be far in advance of the art of manufacturing electrodes. Our necessities represented a requirement that the electrode manufacturers of America and Europe had not been called upon to meet, and it took much time and money before there was finally accomplished the 20-in. round amorphous carbon electrode that is now being used at South Chicago.

WHAT IS PECULIAR TO THE ELECTRIC FURNACE

In a company like this it is perhaps unnecessary to state that the electric current as such has no influence, occult or otherwise, in the manufacture or upon the character of so-called electric steel. The transformation of electrical energy, however, is capable of producing an extremely high heat under comparatively ready control, and of a source of rare chemical purity. While in the application of the electric furnace to the metallurgy of steel there is usually embodied the preliminary removal of impurities by oxidation, the thermal and chemical conditions that obtain are unusually favorable to the final purification of the metal.

Although it has proved perfectly feasible to make steel of superior quality from even low-grade cold metal, the usual practice at South Chicago is to refine in the electric furnace full-blown metal from the Bessemer converter.

While the electric furnace at South Chicago has probably operated on a greater variety of products than any other furnace in the world, especial attention has been given to the production of electric steel for rails. As Mr. Walker has stated, the results have been most promising.

The steel in teeming lies much more quietly than is ordinarily the case with open hearth or Bessemer. The ingots when split show a very solid metal, with a remarkable freedom from blow holes. The pipe, unless filled, is as

deep as with open hearth or Bessemer steel. Segregation is at a minimum, and the steel is exceptionally homogeneous. Chemically speaking, almost any result within reasonable limits can be obtained. Physically the metal is more dense than either open hearth or Bessemer. In its ultimate strength and elongation for the same carbon there is but little difference between electric and open hearth in the higher carbons. In the lower carbons electric steel has a tendency to a higher tensile and a possibly somewhat lower elongation.

Many etched sections of rails indicate that the steel from the electric furnace is peculiarly uniform in structure, and it appears to be exceptionally free from oxide and slag enclosures as partially determined by microscopic examination. In fact, such superiority as electric steel may have probably largely lies in its relative freedom from oxygen.

SPECIAL EFFECTS UPON MOLECULAR STRUCTURE

How much there may be in the theory advanced by some that the characteristics of electric steel are partly due to the influence of the peculiar thermal conditions upon its molecular structure I cannot say. Certain indications, however, point to there being more in this hypothesis than is generally recognized.

As Mr. Walker has stated, we have had thus far received no report of any breakage from the 5600 tons of standard steel rails that we have shipped. Some of these rails have been in tract for two and a half years or more. Some of the first rails that we produced were intentionally made upon the soft side, running as low as 0.55 in carbon. Our later electric rails, of which the laboratory results would indicate a relatively better wearing quality, have been made 10 or more points higher in carbon.

I recognize that on account of the comparatively short time the electric rail has been in service any statement in respect to its comparative quality is open to question. Of course, the final verdict on the merits of any steel must be in that metallurgical court of last resort, result in service. But whatever may be the verdict, American steel practice and the public must be the gainers from the extensive work that has been done in the endeavor to produce, through the electric furnace, a rail of superior quality.

By Eugene B. Clark, Buchanan Electric Steel Company

Mr. Walker's most interesting paper leaves little to be said at present upon the phase of electric furnace working to which he has chiefly devoted himself, namely, the improvement of rails and other heavy steel products. The experience cited by Mr. Walker as having been had with rails rolled from steel refined in the electric furnace, while perhaps not conclusive at present, still points strongly to the wisdom of future experimentation and is confirmed by the experience with electrically refined steels in other directions.

DEOXIDIZATION A PRIME FEATURE

Apparently he ascribes the superiority of electric steel to its thorough deoxidization. There is much in support of this belief, and the reason would appear to be that the electric furnace offers most favorable conditions for treatment by deoxidizing agents. The high temperature keeps the bath fluid and promotes chemical activity, and it is impossible for the steel to take up oxygen again from the neutral atmosphere in the furnace. Under these conditions it is natural that an excess of deoxidizing agents would hardly be necessary unless needed for alloys. The conditions are self-evidently more favorable than in an open-hearth furnace, just as in the latter they are more favorable than in a Bessemer. If electric steel has been made properly it is capable of most advantageous rolling, forging, casting and machining, and as tool steel has excellent cutting properties: It sometimes fails to come up to expectations for certain purposes, however, and gives evidences of peculiarities of disposition not easily explained. Generally the peculiarities are advantageous, but the reasons are not always clear. Perhaps the heat treatment of molten steel has an effect upon its subsequent quality. If so, the type of electric furnace in which the steel is refined must be taken into consideration, for the method of the application of heat to molten steel differs considerably in the different types of furnaces.

In Europe the refining of steel electrically has been done to a far greater extent than in this country, and it is in Europe that the various types of electric furnaces have been developed. The American manufacturer in consider-

ing the practical application of electrical refining to his own problems is interested in knowing: 1, What possible advantages he may expect; 2, what type of furnace is best for his requirements, and 3, what costs he may anticipate. Of course, no general answer to these questions can be made to fit all conditions, but perhaps it would be of interest to say a word with respect to each one.

ARC AND INDUCTION FURNACES

An electric furnace for steel making differs fundamentally from other metallurgical apparatus for refining iron only in that the heat required is supplied through the medium of the electric current. Thus the electric furnace has the advantage that no contaminating gases need be brought in contact with the molten steel. There are two general methods of introducing the heat, distinguishing the induction furnace from the arc furnace. In the former the current is induced directly in the bath of molten metal and heats the metal by overcoming its own resistance, whereas in the latter an arc is established over the bath which heats the metal or slag, or both, directly. The induction furnace has certain electrical disadvantages and also involves certain mechanical difficulties, whereas on the other hand it is free from electrode cost and trouble. The arc furnace is handicapped with electrodes, but on the other hand seems to be simpler of operation and to offer some metallurgical advantages. At any rate, arc furnaces have been more widely used. Several types of arc furnaces have been developed, typical of these being furnaces in which the arcs are maintained between the electrode and the bath, and furnaces in which the arc plays over the bath. Both of these types have certain advantages and certain disadvantages. The submerger arc furnace is more extravagant of electrodes but less severe on linings than in the surface arc type, but on the other hand the heat is localized under the electrode in the former case and distributed over the whole bath in the latter case. What influence, if any, this heat distribution has upon the quality of steel is open to argument, and no effort is intended here to venture an opinion, but certainly this subject is of sufficient interest to warrant study. There are few cases where a steel manufacturer has tried more than one type of furnace.

FOR LARGE QUANTITIES OF STEEL ELECTRIC HEAT IS EXPENSIVE

There are several well-established and quite different lines along which electric furnace practice is being developed at present. The final refinement of large quantities of steel to be used in the manufacture of heavy steel products, this being the phase which has been studied and discussed by Mr. Walker, is the field, possibly, which offers the greatest reward, but is also the one which involves the greatest expense and difficulty of investigation. For such work it is necessary that the amount of electrical heat required should be reduced to a minimum, which means that steel must be made by some other process and only finally treated in the electric furnace. Even such refinement as is found necessary must be reduced to a minimum, because the formation and removal of slags involves the use of a most expensive form of heat. In the final analysis it may be said that if electrical refining is to prove successful for heavy products it must be found that an improvement of quality is assured sufficient to justify the cost, which means, of course, the use of large units and economical methods of handling.

ELECTRIC AND CRUCIBLE PROCESSES

For the very complete refinement of the highest grades of steel, however, the electric furnace is already thoroughly established. Any product possible by the crucible process is possible by the electric furnace, and in most cases with advantage in favor of the latter. Intricate alloy steels may be made with precision. The high temperatures possible facilitate the reactions and alloys need not be used for the purpose of removing oxides and occluded gases. Very low carbon steels may still be kept fluid at the high temperatures. For certain foundry operations electrically refined steel is especially adapted. Small steel castings require a very hot metal and one free from slags and gases. The baby Bessemer gives a hot steel, but one which runs high in oxides and often high in sulphur, so castings are apt to have blowholes and cracks. High manganese and high carbon contents are required to give sound castings, so annealing generally is necessary. The electric furnace obviates these objections by giving a metal at once hot enough to pour into thin molds and still perfectly free

from slags and gases. Metal of exactly the required composition may be obtained, and alloys of any desired analysis may be formed.

Even electric smelting, thought at a great apparent disadvantage by reason of high fuel costs and small units, has made some progress.

HIGH THERMAL EFFICIENCY

The cost of electrical refinement is extremely difficult to discuss. It must be remembered, however, that the essential element of electrical refinement is the production of electric current, and that unavoidable losses in the apparatus for converting thermal energy to electrical energy amount to fully 80 per cent. of the original heat value of the fuel. Thus, even neglecting other costs of electrical power, electric heat is expensive. Hydraulically developed electric power consumes no fuel, but conditions must be most favorable when such power is much cheaper than power from fuel. The high cost of heat used in the electric furnace is offset somewhat by the high thermal efficiency of a properly designed electric furnace, as compared with the thermal efficiency of an open-hearth or crucible furnace, but, in any event, the cost of heat is high in an electric furnace. The cost of repairs and labor in an electric furnace is much higher than for other types of steel refining furnaces, but this is due largely to the small sizes of units, and probably can be much improved. For an arc furnace electrode cost is also a consideration. In general it may be said that only high-grade steels, which have always been manufactured by expensive processes, can be produced in the electric furnace at costs comparable with other methods; but even so the electric furnace for steel refining is already commercially established and its possibilities for further use are sufficient to warrant much additional study.

By S. T. Wellman, of S. T. Wellman & Son

Mr. Walker's paper confirms my own observations as to the new method of refining steel and making an article that is of the very highest quality in every respect. We have heard a great deal in years gone by of the necessity, if high-class steel was wanted, of melting it in a reducing atmosphere; but this has never been possible in the furnaces which we had at our command, because with the reducing atmosphere there came reduction of temperature too low for the proper melting of the steel. But with the electric furnace all these conditions are changed, and we can get the highest temperature known in the arts without the pressure of any free oxygen whatever.

The electrical furnace makes possible the production of ideal steel for any purpose whatever; whether it be the softest steel used for high-grade sheets or plates, medium steel for axles and shafts, rail steel or any of the numerous grades of ordinary tool steel, or for high-speed alloy tool steel or projectile steel.

THE ELECTRIC FURNACE FOR RAIL STEEL

I think that the most important use electrically refined steel can be put to is the manufacture of rail steel. The railroads of this country have been learning some very costly lessons during the past few months as regards steel rail specifications, and it would seem that now they should be ready to buy the best and safest rail that can be made without regard to a slightly higher price or possibly a little more rapid wear. Rails made from electrically refined steel seem to me to offer the very best solution of the problem for the following reasons:

1. An ingot is produced which, from all evidence we have, is almost perfect in structure. There is almost an absolute freedom from blowholes, which is caused by the freedom of liquid steel from oxides and gases of all kinds; but, what is more important, ingots as large as eight tons, as mentioned by Mr. Walker, can be made which are practically free from segregation. Mr. Walker's statements in regard to this confirm my own observations.

2. The ingot can be made practically free from phosphorus and sulphur, and on account of its freedom from oxides and gases little or no manganese is necessary in the steel; thus the steelmaker is able to make the ideal steel which is absolutely free from deleterious impurities, and contains nothing but iron and the carbon to give it the necessary hardness for wear. It will probably be found that on account of its greater density not as much carbon will be necessary to give it good wearing qualities as is the case in ordinary Bessemer or open-hearth steel.

3. On account of its freedom from oxides and gases there is almost perfect freedom from cracking in rolling. This must make a better rail on account of more perfect surface and freedom from little imperfections which start the wear and are also good starting places for cracks.

4. The most valuable peculiarity in electrical steel seems to me to be its freedom from segregation. Most, if not all, the failures of rails during the last winter have been practically on account of bad defects caused by piped ingots, the defects from which were not discovered in the blooms or in the finished rails.

ALLOY ADDITIONS WILL GIVE STRENGTH AND TOUGHNESS TO RAIL STEEL

I think it more than likely that it may be found that the best rail steel, if made from the electrical furnace, can be produced by making small additions of some of the

numerous metals used as alloys, like chromium, titanium, nickel, vanadium or tungsten. The effect of these different metals on steel is not yet generally understood, but it offers a very attractive field for study and experiment. From my own observations, I think that a small percentage of chromium, not to exceed 0.25 per cent., and a very much smaller amount of titanium would have a very good effect on the density of the rail and would at the same time toughen and strengthen the steel.

Some of the gentlemen present may say to me as my friend, Captain William R. Jones, did to William A. Sweet when he went down to Pittsburgh many years ago to the meeting of one of the engineering societies to tell them how to make good rails. Said Captain Bill: "What do you know about making rails? You never made any." Which would be a good criticism of anything I might say about this subject; so I will stop right here.

Metallurgical Developments in Iron and Steel*

Recent Changes and Tendencies in Blast Furnace and Steel Works Practice—Alloys and Heat Treatment

—BY JOHN S. UNGER†—

The increased demand for steel and the many new purposes to which iron or steel is being applied is shown by the fact that in 1880 the United States produced 54 lbs. annually per unit of population; in 1890, 153 lbs.; in 1900, 398 lbs.; in 1910, 640 lbs., or about 12 times as much as 30 years ago. During the last decade the production and consumption of the metal iron has increased about 60 per cent. As the consumption per unit increases and the demand extends to those nations not now large users of iron, the following conditions will result: New fields of raw material will be found; inferior raw materials must be employed; new processes of manufacture will be developed, capable of dealing with material of poorer quality; and substitutes, either metallic or otherwise, will be offered for iron.

Preliminary Preparation of Raw Material

The gradual exhaustion of lump ores has forced the employment of from 80 to 100 per cent. of fine ores in the blast furnace. Such ores are usually inferior physically or metallurgically to lump ores, and require some preliminary preparation. Washing, magnetic separation, pneumatic or other forms of concentration, followed by some form of agglomeration, such as sintering, nodulizing, or briquetting are growing very rapidly and extending to other fine materials, which were practically waste products in the past. The success attained in treating flue dust, pyritic residues and even iron or steel turnings, has caused metallurgists to demand that these artificial products be made the equal of the better grades of lump ore, in order that their use may be extended beyond the blast furnace to the steel furnace, in which a lump ore is almost a necessity.

Coal capable of producing high grade coke by the older methods is only found in certain localities. In the manufacture of by-product coke it has been shown that coke of high quality can be made by the proper admixture of coals, some of which alone are unfit for coking purposes. This coke is the equal of the older coke, thus opening up a new source of supply, and in addition the by-products of the process are conserved.

Blast Furnace Practice

It may be said that it requires about 2 lb. ore, 1 lb. coke, $\frac{1}{2}$ lb. limestone and $4\frac{1}{2}$ lb. of air, or a total of 8 lb. of material to make 1 lb. of iron and $\frac{1}{2}$ lb. slag, while $6\frac{1}{2}$ lb. of gaseous products are given off. Fifty-six per cent. of the material going into a furnace is air. The average variation between winter and summer season in temperature, pressure and moisture and moisture

content will be as much as 15 to 20 per cent., while the variation in a single day may be 8 per cent. Refrigeration of the air or desiccation of the blast has been tried as a remedy, resulting in more regular working of the furnace, more uniform quality of product and a saving of about 50 cents per ton of pig iron produced.

Thin lined, water-cooled furnaces have been used in Europe for some years. In the United States, four or more furnaces have been in blast for some time with promising results. It appears that the blast furnace of the future may be likened to a cylindrical furnace set in a tank of water reaching from the ground to the top of the furnace. This preservation of constant lines in the interior of a furnace and the use of a lining of the proper thickness to maintain an economical heat balance have shown a reduction in fuel, greater regularity of working and less variation in product.

The use of the waste gases with their attendant savings, for gas engine purposes, is more nearly a mechanical problem and not properly within the scope of this paper. It is sufficient to say that the majority of future installations will be of this kind. Where steam engines are installed, they will be connected with low pressure turbines in order to conserve as much of the available energy as possible.

Changes in Steel Processes

Within a few years the use of the Bessemer process has declined very rapidly, being supplanted by the basic open hearth. This was mainly brought about by the scarcity of Bessemer ores and the fact that open hearth steel is slightly more ductile than Bessemer steel of the same strength. A combination of the two processes, known as the duplex process, is used with success at several plants. All steel-making processes of a purifying character are necessarily oxidizing at some stage of the operation. The making of crucible steel is not one of purification, but depends for its superiority on the use of pure materials and their fusion out of direct contact with the fuel.

The electric furnace for the manufacture of ferro alloys is indispensable and has come to stay, while the profitable use of the moderate-sized electric furnace as a substitute for the production of steels of similar qualities to crucible steels, will likely revolutionize the crucible steel industry within a few years. The electric production of pig iron need not be considered at this time. In localities where fuel is scarce and expensive and ore and power are cheap, it will probably be of importance.

Several steel processes have been brought out, mostly combinations of older methods. In one it is proposed to tap the metal from the blast furnace into a rolling open hearth furnace, arranged with tuyères on one side, in which the metal is blown, the slag removed, the furnace

*A paper read at the New York meeting of the American Iron and Steel Institute, May, 1912.

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moved back to a normal position, where the operation is finished by the open hearth process.

Open hearth furnaces with removable ends and roofs are frequently employed. One of the latest modifications is a removable body, which can be used as container or ladle and which is picked up by a crane and carried to the point of casting, thus retaining the heat in the steel and avoiding the use of a ladle. Water-cooled ports, frames and doors are common. The success attending the water cooling of blast furnaces indicates that within a few years an open hearth furnace equipped with water-cooled ports, sides and roof will be the regular practice.

The use of natural gas as a fuel in favored localities is of great importance to the steel industry. This fuel is free from injurious impurities and of high calorific value. As the fields from which this gas is drawn become exhausted, it is constantly necessary to develop new territory to keep up the supply. Since the supply does not equal the demand, the cost becomes prohibitive and substitutes must be used. The results obtained with fuel oil and tar are very encouraging. At some plants where they are so situated in regard to blast-furnaces, open hearth furnaces and by-product coke ovens, the excess blast furnace gas is used to coke the coal, while the higher quality by-product gas is used either alone or with producer gas in the open hearth or heating furnaces.

Deep cementation and that of lesser degree, called case hardening, were formerly performed by means of solid carbon or compounds carrying a large percentage of carbonaceous matter. The increased use of superficially hardened material in gears, roller bearings, cutters, tools, projectiles, etc., has brought out solid compounds of great activity and promoted the use of a number of gases, vapors and mixtures of the same which act very rapidly and at much lower temperature than formerly required in cementation by gases or solids.

Piping and Segregation

These two subjects of widely different character are usually classed together, as they come under the general heading of ingot defects. As a rule they exist together, but in many cases either one or the other will exist in such a limited degree as to be negligible.

Piping may be caused by the shrinkage of the metal during solidification, or it may be due to cavities formed by gases imprisoned in the steel, or to a combination of both causes.

For more than 50 years attempts have been made to reduce piping. These embrace covering the top of the ingot with molten slag or steel, liquid compression, cooling the top of the ingot slowly by a mold in which the top is made up of material which absorbs heat slowly, keeping the metal liquid by gaseous or solid fuel, or the electric arc, casting in a vacuum, the addition of some substance which creates a high temperature at the top, or the addition of elements which absorb the gases. New schemes are brought forward constantly, but an analysis shows them to be modifications of older principles. None have been universally adopted. All fail to accomplish completely the result intended. A few improve the conditions, others are impracticable, while in practically all the cost is prohibitive, except for the more expensive steels.

Some alloy steels pipe very much more than ordinary steels, and even in ordinary steels it may be said that the shrinkage cavity extends to a greater depth in the ingot of a high carbon steel than in one of low carbon.

Segregation is the separation of the more fusible compounds of the steel, as the carbides, phosphides and sulphides of iron, to that part of the ingot which is the last to solidify. Elements having the characteristics of true metals, which alloy with iron in all proportions, as nickel or manganese, segregate very little or none at all, while the non-metals, such as carbon, phosphorus and sulphur, are the worst offenders. The only real cure for segregation must be one of these three remedies: instantaneous solidification of the liquid steel, the use of steel containing elements which do not segregate under ordinary conditions of cooling, or the use of pure iron. None of these remedies is practical, but the nearer these conditions are approached the less the segregation.

When all is considered, probably the cheapest and safest method of dealing with piping and segregation in the ordinary ingot of three to four tons weight is to allow the steel to cool in the regular way, discard 30

per cent. from the top and use the remainder. This discard may not always remove all pipe and segregation, but the pipe which remains will close up in working and the segregation be of such slight extent as not to be injurious.

Iron Alloys

Those alloys in which iron predominates are considered under this heading. Of the 80 known elements, about one-half have been combined with iron in greater or less proportions. Ordinary commercial steel is an alloy commonly made up of about ten elements. Some of these elements, such as sulphur and phosphorus, have always been considered injurious. Nearly all purifying processes have had the reduction of these two elements as their primary object. Sulphur is sometimes added to low-sulphur steel to confer the property of rapid machining, while a certain percentage of phosphorus is of great value in preventing the sticking together of a pack of sheets or to insure a firmly adhering coat of spelter in galvanizing.

All the elements present or added produce certain beneficial or injurious effects, depending on the amount. Manganese up to 1.25 per cent. is a necessity; from this point up to 6 per cent. it produces hardness and brittleness, rendering the material unfit for service. When the steel carries about 12 per cent., a slightly magnetic, hard, ductile alloy of great value in the arts is obtained.

Silicon produces soundness, but renders the steel harder. In steel castings rarely more than 0.50 per cent is used, as higher percentages yield a hard casting difficult to machine. A steel containing 1 per cent. manganese, 1.75 per cent. silicon and 0.50 per cent. carbon will show after proper heat treatment an elastic limit of 200,000 lbs. and an elongation of 10 per cent. Steel containing about 3 per cent. of silicon is difficult to forge or roll, but when finished and properly heat treated will show very valuable magnetic properties, which are indispensable to the electrical engineer. This steel is one of the newer alloy steels.

Carbon varying from traces to 1.50 per cent. produces marked physical changes and seems to show the most pronounced effect of any element. Until the advent of alloy steel and even since then, its proportions largely govern the various properties of the entire range of steels.

Nickel alone or with other elements, as chromium or vanadium, improves the strength of steel without materially decreasing the ductility. At least five classes of nickel steels, ranging from 3 to 36 per cent. nickel, are important iron alloys. The 36 per cent. alloy called invar is remarkable in possessing the least expansion or contraction per unit of temperature of any metallic substance.

Vanadium is one of the newer elements to be added to iron. It seems to rank next to carbon in intensity of effect, and is used in small percentages, usually from 0.25 to 0.50 per cent. It aids in raising the elastic limit of the steel to within 70 to 90 per cent. of the ultimate strength and improves its resistance to failure under repeatedly applied dynamic stresses.

Tungsten was used by Mushet in the development of self-hardening tool steel, contributing the property of hardening while cooling in the air. This discovery was the beginning of the great developments made in the tungsten, molybdenum, chromium, high speed tool steels of the present day.

Of the newer elements alloyed with iron might be mentioned boron, titanium, arsenic, antimony, bismuth, copper and magnesium. Some of these alloys look very promising.

The use of alloy steels containing other than the regular elements is growing very rapidly. One factor that has contributed to their growth is the great advance made in the automobile industry. Statistics shows that over 600,000 tons of alloy steel was made during 1910, or more than three times as much as in 1909.

Heat Treatment

This may be defined as the careful heating of steel to a predetermined temperature, followed by a slow or rapid cooling, usually followed by a second heating to a lower temperature than the first, then by rapid or slow cooling. The temperatures used and the method of cooling employed vary as the composition of the steel or its uses vary.

Treatment affects the mechanical, chemical, electrical and physical qualities of the metal. High temperatures are not always essential to these changes. Certain steels will become three times stronger at -180°C . and show

very little change in ductility. Other steels non-magnetic at ordinary temperatures become highly magnetic at the temperature of liquid air. Prolonged heating in boiling water will destroy the hardness of a carefully tempered edge tool. Heating a soft steel, not ordinarily sensitive to heat treatment, to between 300 and 400 deg. C. and then quenching will show a marked reduction in ductility and a decided difference in solubility when acted upon by chemical agents.

Steels may be separated into three classes: Soft steels up to 0.25 per cent. carbon, medium steels from 0.26 to 0.75 per cent. carbon, and hard steels, or those above 0.75 per cent. carbon.

Soft steels, such as sheets, wire, or tubes, are but slightly changed by heat treatment, unless the action be continued over a very long period. In some cases this may prove detrimental. Very few attempts have been made to treat steel of this grade beyond an annealing or normalizing to insure uniform heating and cooling throughout.

Medium steels furnish by far the largest portion of the tonnage of all steel produced. In this class is found all the harder and stronger varieties of boiler and ship plates, machinery steel, rails, axles, steel castings, car wheels, shafting, wood working implements, most of the structural and bridge material, and a large quantity of the steel used in automobiles and agricultural machinery. The medium steels have not always been treated, except for such special cases as armor, guns, crank shafts, connecting and piston rods, or any material in which great strength, durability and security are required. Almost all alloy steels belong to this class. On account of their thermal susceptibility they are usually heat treated to develop their best properties.

The annealing of steel castings in important work is essential. Very little strength is sacrificed, while the toughness as indicated by bending or twisting has been increased from two to four times that of the untreated casting.

Railroad axles, shafts and forgings were not heat treated in the past. As the alloy steels with their accompanying heat treatments were brought out, attention was immediately given to the treatment of ordinary steels. Most forgings are being heat treated at the present time. It is believed that the treatment now being given to gears, shafting, rails, wheels, plates, bars and machinery parts will grow until practically all such material will be used in a heat treated condition.

Hard steels, known as tool steels, are not often used in an untreated state. These steels were the first steels made and were valuable, as they could be made intensely hard by heating and quenching in water. It was found that this hardness could be modified by subsequent heating or tempering, yielding a tool or implement of great value. A temperature of 400 deg. C. removes this hardness and makes the tool too soft to cut hard metals.

The classic researches of Taylor and White, the inventors of the treatment of high speed chromium-tungsten tool steels at such elevated temperatures as were supposed to destroy such alloys, are an important point in the metallurgical history of tool steels. This discovery completely changed a part of the hard or tool steel industry and revolutionized machine tool operations. This treatment yielded a steel of such wonderful cutting properties that machine tools all over the world had to be built much stronger, of greater power, and capable of being driven at much higher speeds than formerly.

Future Possibilities

When the great changes in railroad material in the last quarter of a century are considered it is reasonable to believe that the freight car of the future will regularly carry a load of 100 tons. Its size will only be limited by bridge, tunnel or other clearances. A reinforced concrete roadbed, carrying a track of 150 to 200-lb. rails on steel supports, or perhaps duplicate rails laid a few inches apart on each side of the track, will probably be the standard practice a few years hence. As the elastic limit of the axle wheel and rail are approached, a higher limit will be required, limited only by what the steel maker can produce and by the point to which this may be carried and still retain sufficient traction under engine wheels to move the load. To distribute the load, four wheels may be

mounted on the same axle, or additional wheels and axles put under the future car. The effort to secure a strong material of the least weight, in order to reduce the dead load carried, will always exist. Similar progress will be made in the machinery and building world.

The demand for a stronger, lighter, less corrodible metal will continue and its use will be governed by its extra cost in comparison with regular material. Iron rusts more rapidly when exposed than almost any of the other common metals. The attempts to protect it by coatings or metallic coverings have done much to increase its durability. It is not an exaggerated statement to say that future researches will develop a method of treating iron which will greatly retard or wholly prevent corrosion. How this is to be accomplished is left to the future. Exposure to a gas or vapor, aided by heat, pressure or the electric current, may render the iron entirely passive, or diminish the effect of atmospheric conditions. It may be that more than such a simple treatment will be necessary, and that after such a passive condition has been produced it must be fixed or made permanent by additional treatments, as quenching, exposure to other gases or vapors, or to chemical solutions to obtain the desired result.

Discussion

By Dr. George B. Waterhouse, Lackawanna Steel Company

Dr. Unger's subject and paper cover such a wide range that it is impossible to discuss them adequately in the short time available. One of the principal lessons brought home to me by a careful reading of the paper is the manner in which the old rule of thumb practice is being replaced by carefully worked out scientific methods. The greatest development in the manufacture of iron and steel and one which has been most fruitful in results is the growing application of these scientific methods of study and examination to both processes and products.

Dr. Unger has mentioned many developments in the blast furnace industry; but one has escaped notice, namely, the very successful utilization of blast furnace slag in the manufacture of a true Portland cement. This has only been made possible by the most careful chemical and physical research into the nature and constitution of cement and the various blast furnace slags. It has involved many beautiful problems in what may be called chemical physics, and their successful solution reflects great credit on the chemical engineer of this and foreign countries.

Another instance of what I mean is the subject of corrosion, treated in Dr. Cushman's paper. This very important matter is being studied by careful workers in many countries, and methods for the prevention of corrosion will undoubtedly be the ultimate outcome of the splendid research being carried on.

Also in regard to alloy and special steels, the same methods have been followed with success, and in this respect the company I am associated with has done considerable work with the use of titanium in commercial steel.

Possibly the greatest example of the application of scientific methods to the industry is to be found in the last subject but one discussed by Dr. Unger, namely, that of the heat treatment of steel. This has been growing in importance in a remarkable way in recent years, and could not be carried out without the aid of scientific instruments such as pyrometers, the microscope and accurate machines for measuring hardness and other physical properties. The greatest point of interest, however, is the fact that careful research, undertaken in the first place by pure physicists, has revealed many of the fundamental rules underlying the successful heat treatment of steel.

Dr. Unger's paper is largely prophetic in spirit, and it is therefore permissible to follow his example. In view of the fact that we are now largely working along right scientific lines, it is possible for us to look forward into the future with confidence, with the belief that we shall be able successfully to meet all of its requirements.

The sheet metal contractors of St. Louis have about completed arrangements for the annual convention of the National Association of Sheet Metal Contractors, which will be held in that city June 10 to 14. Two local bodies are affiliated with the national body, the Sheet Metal Contractors' Association and the Sheet Metal Consumers' Protective Association.

Corrosion of Steel and Its Prevention*

Examples of Unusual Resistance in Wrought Iron—Analyses Corresponding to Those of the Newer Open Hearth Products

BY ALLERTON S. CUSHMAN†

The problem of the corrosion of steel may be considered from two distinct points of view. On the one hand we might discuss the manufacture of metal specially designed to be slow rusting and resistant to corrosion, while on the other hand we might confine ourselves to a consideration of methods of treatment by the application of protective coatings or in other ways, so that even the usual grades of commercial steels may be made as rust proof as possible.

To cover either field of inquiry fully in the brief time allotted would be quite impossible, so I have preferred to select some special phases of the subject. It seems to be the general consensus of opinion that the old hand-worked irons which preceded the products of our modern pneumatic processes possessed a wonderful quality of resistance to corrosion, and it is therefore pertinent for us to inquire whether a study of ancient specimens of iron and steel may not point the way to improvement on the modern scale of metallurgical operation. I would like to point out, however, the importance of bearing in mind that the chemical constitution of iron or steel is only one factor of the problem, for the amount and kind of work that a given product receives will profoundly influence its physical character and qualities. We live in a practical age and it is essential that we should consider our great industrial problems from a practical viewpoint. No sensible person would propose a return to the old hand-worked methods of manufacture, for modern conditions could not support such an industry. And yet it seems to be a law of Nature that her materials should respond to the manipulations of the hands of man and acquire properties that machinery cannot give. As an example of this, we have only to remember the everlasting qualities of the hand-worked lacquers and enamels of the Orient, and compare them with the machine and brush laid coatings of our own industrial processes.

Iron Fifteen Centuries Old

The most ancient specimens of iron that have been studied, so far as I can ascertain, have been reported upon by Sir Robert Hadfield in a paper on "Sinhalese Iron and

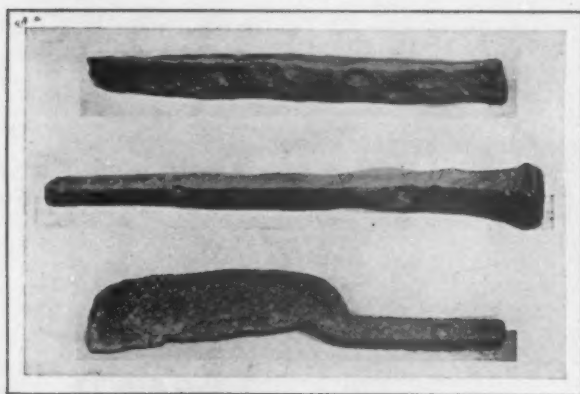


Fig. 1—Nail, Chisel and Billhook of Ancient Sinhalese Iron Manufacture from Columbo Museum

Steel of Ancient Origin," presented before the Royal Society and also before the Iron and Steel Institute of Great Britain. These interesting specimens taken from the Columbo Museum consist of a rude chisel, a nail and a bill hook, which date unquestionably from the fifth century and may therefore be said to be about fifteen hundred years o'd. Considering that for the larger part of this time these

specimens have been subjected to the corrosive influences of Nature, they are in a remarkable state of preservation, although showing, as would be expected, some effect of the ravages of time. They are shown in Fig. 1. The chemical constitution of the three specimens was very similar, as shown by the analyses below:

	Carbon	Manganese	Sulphur	Phos.	Silicon	Copper
Chisel	trace	nil	0.003	0.28	0.12	0.090
Nail	trace	nil	nil	0.32	0.11	0.119
Bill hook....	trace	trace	0.022	0.34	0.26	0.012

These specimens would, of course, be classified as wrought irons and not as steels, but from the viewpoint of their wonderful resistance to corrosion it is interesting

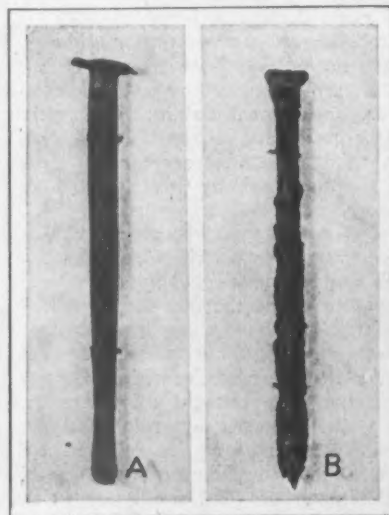


Fig. 2—Wrought Iron Nail, A, in Service Since 1807. B, Modern Wire Nail.

to note that carbon and manganese are absent, with very low sulphur, whereas, according to the standards of modern iron metallurgy, the phosphorus content is extraordinarily high. The high silicon content probably represents slag, and if so is not significant. We should expect such a metal to be cold, short and brittle, which it undoubtedly was, but unquestionably material of a very similar

constitution could be made today in an open hearth furnace, and subsequently rolled without giving special trouble.

A Wrought Iron Nail of 1807

I shall now present some data on some specimens of iron which have been recorded in this country and which have shown themselves to be extraordinarily resistant to corrosion. Specimen No. 1 is an old wrought nail known to have been used in the construction of the Masonic Hall at Richmond, Va., in 1807. It is shown in the illustration compared with a corroded modern nail (Fig. 2). This specimen came into my possession in 1908, with the information that it had been found half driven into the old oak studding so that the head and half of the shank was exposed to the weather for the major portion of its century of service. It was in a marvelous state of preservation, the forged edges of the head remaining quite sharp and unruined. The analysis is remarkably similar to that of the old Sinhalese wrought irons.

Carbon.	Manganese.	Sulphur.	Phosphorus.	Silicon.	Copper.
0.03	0.06	.013	0.205	0.121	.027

Specimen No. 2 (Fig. 3) is an old band or sleeve which was attached to a bronze cannon captured from the British by the American troops at the storming of Stony Point in 1779. The cannon has been used for monumental purposes and has stood for many years exposed to the full force of the elements. The iron sleeve has been wonderfully rust-proof, and the old hammer marks made when it was forged are clear and sharp. The analysis follows:

Carbon.	Manganese.	Sulphur.	Phosphorus.	Silicon.	Copper.
0.010	0.010	.005	.07	trace	.080

*A paper read at the New York Meeting of the American Iron and Steel Institute, May, 1912.

†Director, Institute of Industrial Research, Washington, D. C.

Here again we find low carbon, manganese and sulphur, with a tendency toward high phosphorus.

Links from an Old Chain Bridge

Specimen No. 3 is a collection of iron links from the famous old link suspension bridge (Figs. 4 and 5) which was built in 1809 at Newburyport, Mass., and known as the Essex-Merrimac chain bridge. This bridge was in continuous use until the late summer of 1909, having completed practically a full century of service. The links, which proved themselves wonderfully resistant to corrosion under most severe conditions near the seashore, are shown in Fig. 6. The analyses of three separate links, although not the individual ones shown in the illustration, are as follows:

	Carbon.	Manganese.	Sulphur.	Phosphorus.	Silicon.	Copper.
Link A.....	0.05	trace	0.007	.032	0.019	0.43
Link B.....	0.12	trace	0.010	0.70	0.047	0.018
Link C.....	0.04	0.01	0.006	.020	0.028	trace
Link C.....	0.04	0.01	0.006	.020	0.028	trace

The above analyses were made in the research department of the American Rolling Mill Company. Material from the same bridge has been analyzed and reported by

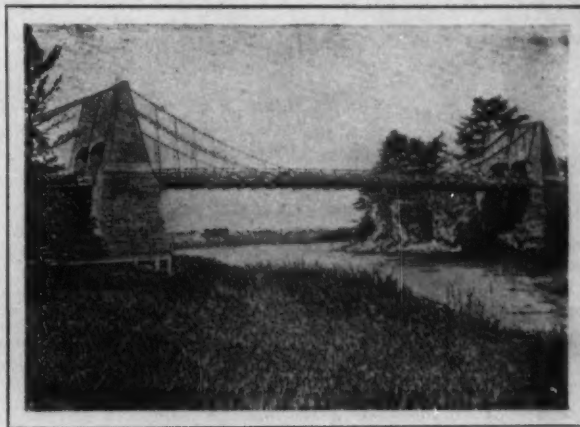


Fig. 4—Essex-Merrimac Chain Bridge, Newburyport, Mass., 1809

corrugated roofing which was found on the Isthmus of Panama, where it had been abandoned by the French many years ago. The corrosive influences are so severe on the Isthmus that samples of this material were passed from hand to hand among metallurgists in this country as an interesting exhibit of durable metal. Although the durability may be largely due to the heavy spelter coating, it is more than doubtful if our modern steel galvanized sheet would last as long in that atmosphere. An analysis of the metal is therefore of interest. It is as follows:

Carbon.	Manganese.	Sulphur.	Phosphorus.	Silicon.	Copper.
0.02	0.04	0.061	0.427	0.12	0.031

The sample was inclined to be brittle, as we should expect with such high phosphorus; but again we find low carbon and manganese, with sulphur moderate.

Specimen No. 5 [not shown] represents two small nails in a wonderful state of preservation after 100 years service on the roof of old Faneuil Hall in Boston. Unfortunately, only the carbon and manganese were determined owing to the smallness of the specimens.

	Carbon.	Manganese.
Nail A	0.03	0.01
Nail B	0.03	nil

Elimination of Manganese and Sulphur

It should be stated that the above examples of ancient irons have not been selected in order to prove any point whatsoever. They represent every authentic case of extraordinary corrosion resistance of which I have been able to make a record. I do not even make the claim that these records prove anything, but I submit them to your attention as being highly suggestive and interesting. I have long believed and have so stated in many publications that extreme purity in respect especially to manganese and sulphur is a contributing influence toward durability in a material whether it be classified as iron or steel. I am, of course, not unmindful of the metallurgical difficulties in the way of manufacturing steel free from manganese unless the carbon is also to be eliminated. If the carbon is eliminated, we are, in my opinion, dealing with iron and not with steel, no matter by what process the metal has been manufactured. From the viewpoint of resistance to



Fig. 3—Forged Iron Sleeve from Monumental Bronze Cannon Captured from the British at the Battle of Stony Point, 1779

Prof. A. P. Mills, of Cornell University. The illustrations are taken from Professor Mills's interesting paper in the Cornell Civil Engineer, April, 1911. He concluded that the excellent resistance to corrosion was due to copper, as all the sample links worked on at Cornell showed high copper. As is shown above, however, the links in which copper was absent were just as long lived as those which contained nearly $\frac{1}{2}$ of 1 per cent. of that element. In this connection it may be noted that the copper content of Sir Robert Hadfield's old irons was variable, and Sir Robert writes me as follows under date of March 19, 1912: "As regards the effect of copper in adding resistance, all the specimens are more or less alike; whereas if this element has any influence the nail ought to have shown less corrosion than the others. I think, therefore, you are right in not accepting the theory that the addition of copper will enable iron and steel to resist corrosion."

Returning to the analyses of the Newburyport links, we find again a tendency to low carbon, manganese and sulphur, with moderately high phosphorus.

Specimen No. 4 [not shown] is a sample of galvanized

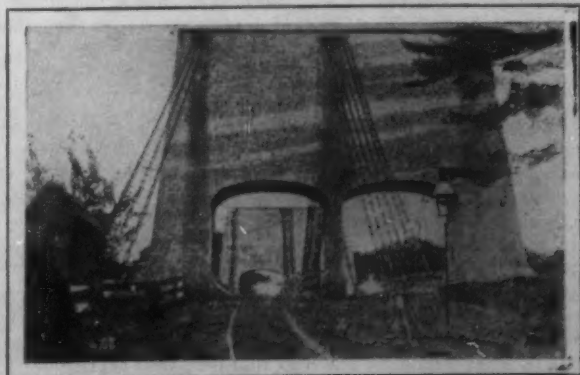


Fig. 5—Approach to Essex-Merrimac Chain Bridge

corrosion, manganese might be tolerated if sulphur was absent, but here again we run into a metallurgical difficulty.

It has recently been shown in some papers presented before the Iron and Steel Institute of Great Britain that the tendency of steels to corrode increases with increasing carbon, up to a certain maximum. This is in accord with the electrolytic explanation of the mechanism of the reactions which produce corrosion. The electrolytic explanation of corrosion is now very generally accepted by scientific men.

Pure Irons from Open Hearth Furnaces

To sum up the conclusions that have been reached as the result of many scientific studies of corrosion, it may be said that homogeneity or freedom from at least excessive segregation is an essential to a high degree of corrosion resistance in either iron or steel. One way to reach homogeneity is to allow little or no impurities to be present to produce segregation, as is done in the manufacture of the very pure irons which are now made in open hearth furnaces. I am glad to be able to bear witness to the great metallurgical accomplishment that has been worked out in this country through patient and determined effort.

The manufacture of commercially pure irons in open hearth furnaces on the large scale of operation usual in modern steel making was only a short time ago considered a metallurgical impossibility and even now in Europe there are metallurgists who do not believe that it can be done. Not so long ago a British engineering journal stated editorially that the making of open hearth metal free from manganese was an impossibility, but even if it could be done the metal would be superoxidized and unfit for rolling or for use.

For many years we have been accustomed to turn to Norway and Sweden, when iron of exceptionally purity was desired. Now it can be obtained even purer in this

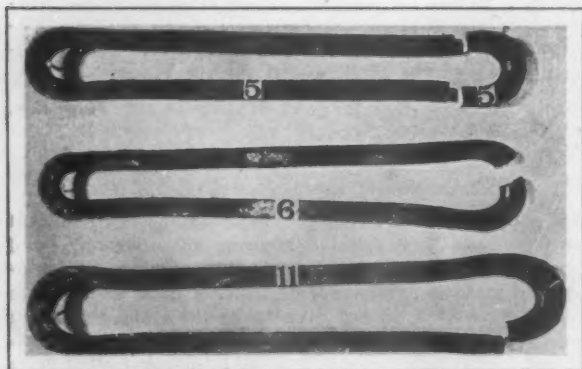


Fig. 6—Links from Suspension Chains, Essex-Merrimac Chain Bridge

country on a larger scale and for less money. In my opinion, the accomplishment of the manufacture of iron of extraordinary purity in the open hearth furnace should be noted and honored, as it would undoubtedly have been had its development taken place on the other side of the Atlantic. From a patriotic point of view, if for no other reason, it is satisfactory to reflect that Europe is now beginning to consider this country as a source of supply for the purer irons for which for many purposes there is a growing demand.

Protective Coatings

We must admit, however, that the manufacture of slow rusting iron or iron alloys is a specialty only to be undertaken by specialists, and that the great mass of steel tonnage that goes into structural material calls for protection from corrosion. We are all more or less familiar with the strenuous efforts that have been made in recent years to improve the methods of coating iron and steel with protective coatings of other metals such as zinc, lead, copper and various alloys. These methods and improvements I have not time here to discuss. It is evident that the great mass of steel structural material that goes into service must depend upon paint coatings for its protection. We all know that there are hundreds of "best paints" offered in

the market for iron and steel work. As the only perfect test of a paint is a service test, considerable time must elapse and money be wasted before we can find out the facts. We are also frequently confronted with other difficulties. If, for instance, we have concluded that red lead is a safe prime coater, we are suddenly confronted with the fact that all red leads are not alike and also that the conditions and methods of application are important factors.

I am glad to be able to report that great progress has been made as the result of the application of scientific investigation and principles to the general subject of protective coatings. As the result of a systematic series of exposure tests on steel panels erected at Atlantic City under the auspices of the American Society for Testing Materials, we now know how to select intelligently materials for prime coating iron and steel. We have been able to divide pigments, roughly at least, into classes known as "inhibitors" and "stimulators" of corrosion. The discovery that certain substances when laid out in an oil film on the surface of steel actually accelerate, while others check or retard corrosion, gives us a basis of scientific selection on which to write specifications for protective paints.

Discussion

By L. J. Campbell, Assistant to the President, Youngstown Sheet & Tube Company

I think you will agree with me that Dr. Cushman's paper presents considerable difficulty to one who would discuss it. He has carefully avoided drawing conclusions, and only in a very slight degree do his observations admit of discussion. In brief, he has considered some half dozen specimens of iron which have resisted corrosion to a remarkable degree over periods of time ranging from one to fifteen centuries, presented the analyses of the specimens selected and called to your attention the fact that the low carbon steels now being manufactured by the open hearth process conform in some respects to these analyses. The examples cited by Dr. Cushman all consist of what we call to-day old-fashioned wrought or forged iron, and your crossroads blacksmith will tell you that no iron or steel to compare with it in durability has yet been invented.

PUDDLED IRON PRODUCTS IN SERVICE

Dr. Cushman says that the specimens discussed by him represent all the extraordinary examples of corrosion resistance of which he has been able to make a record.

If 25 to 50 years' resistance to the corrosive influences of nature can be considered extraordinary in this day of short lived steel products, many additional examples could be given. These consist of cases where puddled iron products have successfully resisted corrosion. Many a puddled iron roof is in existence to-day, after 30, 40, even 50 years of service, apparently in as good condition as the day it was laid. Instances such as these and the ones Dr. Cushman cited present irrefutable facts and demonstrate conclusively that certain iron products have successfully withstood the service test.

There is, of course, a reason for this remarkable characteristic of iron. Experimentation would tend to show that the answer cannot be found in analysis alone. Indeed, I feel that altogether too much stress has been placed upon analysis at the expense of physical characteristics. Were chemical analysis the only guide of the diamond prospector, for example, the headquarters of the diamond industry would long since have been changed from South Africa to the anthracite fields of Pennsylvania. Wrought iron, which is the only iron or steel which we can demonstrate to have actually resisted corrosion in a satisfactory manner, presents a characteristic and striking physical structure. It is fibrous, the iron fiber to a large extent being covered with a protective coating of slag, and many authorities hold that this slag coating protects the iron and gives it the resistance to corrosion which we all know it possesses. Again, iron in its manufacture is worked and kneaded so that it is possible that properties are imparted to it in this way that cannot be expected in steel which receives a dissimilar treatment. These points and others with reference to wrought iron should receive careful consideration in conjunction with analysis.

THE CLAIMS FOR LOW CARBON STEELS

Dr. Cushman has mentioned the fact that low carbon steel is being manufactured which conforms somewhat in analysis to the old style irons. As you are aware, much merit is claimed for these newer products. The basis of these claims consists of various accelerated tests, notably the action of sulphuric acid, which are taken by the experimenters as indicative of the metal's behavior in actual service. These accelerated tests have been so generally discredited and so strongly denounced that it would seem a waste of time to dwell upon them here, were it not for the fact that they form the sole argument upon which merit claims are made by the manufacturers of these so-called open hearth "irons" and non-corrosive metals. The American Sheet & Tin Plate Company, the La Belle Iron Works, the Youngstown Sheet & Tube Company and other well known iron and steel companies have publicly gone on record as doubting the value of such tests. The American Society for Testing Materials has vigorously denied any belief in the value of the tests and in unmistakable phraseology calls "attention to its (the test's) utter inability to give a reliable indication of the relative ability of metals to withstand the corrosive action of exposure to the weather." Among the many expert investigators who condemn the accelerated corrosion test, none is more clear in his denunciation than the distinguished gentleman who preceded me, Dr. Cushman himself.

ACCELERATED CORROSION TESTS DISCREDITED

In Bulletin 35 of the Office of Public Roads, issued by Dr Cushman in May, 1909, he says:

It has been found that this pure steel (or iron) resists the attack of acids to a high degree, and an acid test has been proposed to predetermine the resistance to corrosion of various types of metal. This proposal has, however, met with decided opposition from some metallurgists, who believe that the test is not a rational one. The need of a quick preliminary test for determining the resistance of steel and iron to corrosion is universally conceded. It is, however, in the opinion of the writer, extremely doubtful whether such a test is possible, in view of the fact that the autoelectrolysis which is slowly but continually at work in the natural process of rusting does not proceed in the same way in any short-time test. This criticism applies to all the various tests which have been proposed, such as immersion in corrosive liquids while air is being bubbled over the test pieces. A considerable amount of work has already been done in investigating this particular problem, and the results have already been in part published in the Transactions of the American Society for Testing Materials. More work is being done and will soon be published. Up to the present time there would seem to be but one perfectly sure criterion, and that is the test of service.

Nearly two years later, March 20, 1911, he said:

I am in receipt of yours of March 18th, in which you ask me whether my investigation work in regard to the preservation of iron and steel has developed since the publication of my Bulletin 35, issued May 21, 1909. I have been continuing my studies of this subject along all possible lines, and in some respects there has, of course, been new information available since the publication of my bulletin. I do not know, however, that there are any of the conclusions that I had arrived at in Bulletin 35 which I should wish to change at the present time.

Again in April, 1911, he said:

There is no question about it that manufacturers have worked this test overtime, and to a certain extent in a very unfair way.

Under date of March 3, 1911, in a report by the Institute of Industrial Research, on the efficiency of zinc coatings, Dr. Cushman again expressed his opinion of accelerated tests. He said:

Without the slightest dishonest intention or desire, every testing engineer or expert will find himself influenced by an impulse to make as good a showing as possible for his clients. Moreover, in case a technical discussion is going on, which has an important bearing upon industrial enterprise, an investigator will find himself almost obliged to take one side or the other. If he has, as the result of certain tests, formed a conclusion favorable or otherwise to a certain type or class of material, he will find it difficult to avoid a bias which tends to set him in a certain direction. For this reason purchasers should not allow themselves to be influenced by the showing made by a series of laboratory acceleration tests that appear to claim that any one of the methods of zinc coating is much inferior to another. The general experience in service lasting over considerable periods of time and the accumulated tests made by a number of different investigators do not justify any such conclusion.

TWO SERVICE TESTS OF THE NEWER OPEN HEARTH PRODUCTS

With claims for durability based upon such unstable ground, it should be interesting to know just how the new steels in question stand up in actual service. I have here a piece of ingot iron which I placed on my window ledge a little less than a year ago. This was cut from a 14-gauge sheet and the most friendly critic must admit that it has corroded to an alarming extent in its brief period of exposure.

I also have here another piece of ingot iron which has an interesting history. On November 16, 1909, James Hern & Co., of Springfield, Ohio, purchased a quantity of 18-gauge ingot iron sheets from Ach & Co., of Springfield, and later, February, 1910, made them into a smokestack for the Ferncliff Floral Company of the same city. The boiler of the Floral Company is only in service during the cold weather, being used for heating purposes in a greenhouse; yet in October, 1911, the stack collapsed after less than one year's actual service. An analysis of the sample I have here gives the following results:

C.	S.	Mn.	P.	Rust Fe O.
Trace	0.010	Trace	0.007	30%

An Ohio Roof of Puddled Iron

I have a third sample of material which is a specimen of puddled iron roofing which has seen 40 years of service on the warehouse of the Globe Foundry & Machine Works at Niles, Ohio. W. B. Carter, manager of the company, wrote with reference to the roof under date of March 1, 1911, as follows:

In reply to your request for information regarding the old-fashioned iron roof on our warehouse, would say that the building was erected and the roof placed in 1871. I was then but 12 years old and remember quite distinctly of helping to give the roof its first coat of paint. The roof has received but two applications of paint, the second one between 20 and 25 years ago. No repairs have ever been made on the roof.

There is every reason to believe that this roof has many years of usefulness left. It is interesting to note that samples taken from this roof and subjected to the accelerated acid test make a miserable showing. In fact the old iron does not compare favorably with Bessemer steel when subjected to the acid test.

A second point of interest in connection with the iron roofing, and I could give scores of examples of its durability would the list not tire you, is that it is in nearly all cases made of light sheeting. This means that the surface area is very large in proportion to the total weight. With a nail or chisel the surface exposed to corroding influences is inconsiderable in comparison to the total weight, while with sheets the reverse is true, which makes their excellent lasting qualities the more remarkable.

While the production of these so-called "irons" or metals has been a brilliant commercial success, I am not willing to admit it has been or should be considered a metallurgical triumph. As far as carbon and manganese are concerned a very pure steel can be made in the Bessemer converter, and the production of a somewhat purer metal by the open hearth process hardly seems difficult of conception, and once conceived certainly not difficult of execution at an extra cost of not to exceed \$2 per ton.

A CALL FOR THOROUGH INVESTIGATION

Dr Cushman has expressed the hope that a deeper interest may be taken in this subject of corrosion. I heartily second his wish. Particularly do I desire to lay emphasis upon the ethical rather than the technical side of the question. In my opinion too much effort has been expended, in this country at least, in trying to fit theories of corrosion to commercial practice. What I wish to make an urgent plea for is a comprehensive, broad-minded, unbiased investigation, free from commercialism, of the mechanism of corrosion. I speak frankly on this subject, as I have no axe to grind. I am employed by the Youngstown Sheet & Tube Company. We manufacture puddled iron and Bessemer steel and are preparing to manufacture open hearth steel. We have diversified our product because we recognize that no one material can be satisfactory for universal use and we are desirous of giving the consumer the material best adapted to his requirements.

Puddled iron, which is the most non-corrosive iron product now being manufactured, cannot be generally used. It is only possible to use it in a limited way, and even if

its physical properties would permit it to be used more widely its high cost and difficulty of production would render it impractical. A new material capable of general use is imperatively needed, and search for it must not be abandoned, but vigorously prosecuted. The splendid achievements of the special steel makers in producing the high grade alloy steels, tool steels, and electric steels which are now on the market point the way in this no less important phase of the industry.

Air-Driven Tube Cleaner

A new type of air-driven boiler tube cleaner has been placed on the market by the Lagonda Mfg. Company, Springfield, Ohio. It is intended for use in power plants where water is expensive or the pressure is too low to give sufficient power to drive a water turbine cleaner. It is claimed that by reason of its design and construction this cleaner will develop more power with a smaller air consumption than any other type thus far placed on the market. Fig. 1 is a complete view of the cleaner, while Figs. 2 and 3 are transverse and longitudinal sections, respectively.

As will be noticed from the engraving the cleaner is of simple design and has few parts, all of which are made extra heavy to withstand the hard bumps to which a boiler tube cleaner is subjected in removing hard scale. A good idea of the operation of this cleaner can be gathered from an inspection of Figs. 2 and 3. The compressed air passes through two ports A in a plate in the rear end of the cleaner and then through transverse openings B, into the rotor C and out through branched openings to the space behind the paddles D. It will be noticed that there are only two ports openings into the air chamber and only the two paddles which are doing the work are subjected to air pressure, there being no communication to the two idle paddles. In this way it is pointed out that the excessive leakage of air which is one of the main difficulties encountered in the operation of air-driven cleaners has been eliminated. After the air has expended its energy behind one of the paddles an exhaust port, E, is uncovered and the expanded air is permitted to pass out through the front end of the cleaner.

The cleaner is supplied with either the Weinland quick repair head, which was illustrated in *The Iron Age* March 17, 1910, or with any of the other types manufactured by this company. It is built for cleaning tubes

New One-Part Screw Anchor

The Diamond Expansion Bolt Company, 90 West street, New York City, has placed on the market a new type of one-part screw anchor which is known as the Diamond N. This new device, while embodying all the good qualities of the regular pattern, is said to possess the added advantages of greatly increased holding capacity due to the maximum expansion of the shield being at the inner end and greater convenience in use.

The transverse ribs at the inner end of the shield give a uniform and secure bearing and grip into the fibre of



The Improved Diamond N One-Part Screw Anchor Made by the Diamond Expansion Bolt Company, New York City

the material into which it is fastened securely. It is also emphasized that a greater contact surface is presented than was formerly the case with a series of diamond points. The longitudinal ribs at the outer end of the shield are placed there to bind in the wall with a driving fit and serve to prevent the shield from turning when the screw is being inserted. It is stated that in a number of cases where the anchor was being extracted from the hole it pulled out a section of the wall with it.

Activity in American Shipbuilding

An interview with H. L. Aldrich of Marine Engineering, published in the *New York Herald* May 19, gives a most glowing picture of conditions in American shipyards, which he states have not been so busy for 12 years as they are today. He says that since about the beginning of the year orders have been placed for 110 steamships of various classes which, with one exception, are for the coastwise trade. The exceptional activity dates from last fall and has been on the increase ever since.

Much of the tonnage now under consideration or construction is a direct result of the preparation for the opening of the Panama Canal. Mr. Aldrich says that when Congress takes some decisive action in the matter of tolls and regarding railroad-owned steamships he is confident that something more will be done. It is significant that one company has placed orders for 80,000 tons of ships in the last six months, being such an order as had not previously been equaled in American shipbuilding history. A

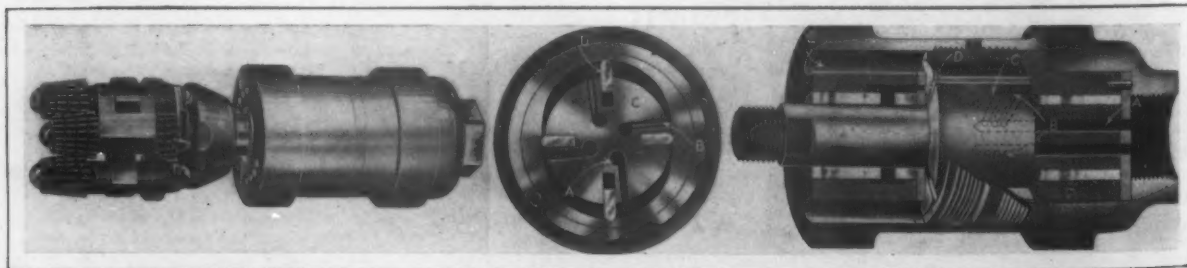


Fig. 1—The Cleaner

Fig. 2—Transverse Section

Fig. 3—Longitudinal Section

Three Views of a New Type of Air-Driven Boiler Tube Cleaner Developed by the Lagonda Mfg. Company, Springfield, Ohio

ranging from 1 to 4 in. in diameter and a special design is available for use in curved tubes.

To permit the cleaner to be operated economically under different air pressures and in different hardnesses and thickness of scale, two interchangeable rear plates having different size port areas are provided. The one with the smaller hole is intended to be used where only a limited amount of air is available, while if the scale is heavy and plenty of air can be furnished the one having the larger holes can be used. In this way it is possible to develop considerable power with a small amount of air and as much more as may be required to remove the harder scale.

The labor troubles in the Missouri lead belt, which it was thought were settled by the recent advance in wages, have broken out again in the shape of refusal of the operators to go farther than the increase in pay.

still larger order is being held up pending the action of Congress on the toll and railroad questions. Two months ago the Pacific Mail Steamship Company opened bids for four ships of 38,000 tons capacity each, but no decision has been reached as to the contract, which awaits the action of Congress.

The *Herald* also gives an interview with President G. S. Dearborn of the American-Hawaiian Steamship Company, who states that his company now operates 18 steamships and will have 26 when the vessels now on order are completed. He says that he has no doubt there will be a large increase in business after the opening of the Panama Canal. Being confident that it will necessitate a greatly increased capacity for his company, steps have been taken to be ready for the trade expansion.

The Dominion Steel Corporation's wire and nail factory at Sydney, N. S., is now ready for operation.

Open Side Vertical Milling Machine

An improved type of open side vertical spindle milling machine has been recently placed on the market by the Beaman & Smith Company, Providence, R. I. In the design care has been taken to embody all of the features usually found in a tool of this character. Strong construction and ability to handle a large variety of work are two of the features which characterize this machine.

The machine consists of a bed supporting a work table and an upright which in turn carries an overhanging arm or cross rail. A saddle which has a horizontal movement on this overhanging arm carries the spindle. The cross rail or overhanging arm is of substantial construction and is proportioned to resist the pressure of the cuts. A vertical power movement on the upright having a range of 11 to 32 in. per minute is provided.

The working surface of the table which is 6 ft. long and 18 in. wide is surrounded by a trough. Four T slots cut from the solid and two rows of holes for stop pins are provided. The table has a movement of 81 in. on the bed and has a quick power movement of from 9 to 26½ ft. per minute in either direction as well as an automatic stop. The feeds for the table are positive in either direction and are secured by gearing contained in a conveniently located feed box. Nine changes in all, ranging from 1 to 8½ in. per minute at any spindle speed, are available and changes from one to another can be quickly made and it is emphasized that these feeds are maintained at the desired rate for any spindle speed. A screw in a revolving bronze nut operates the table, the thrust being taken by ball bearings.

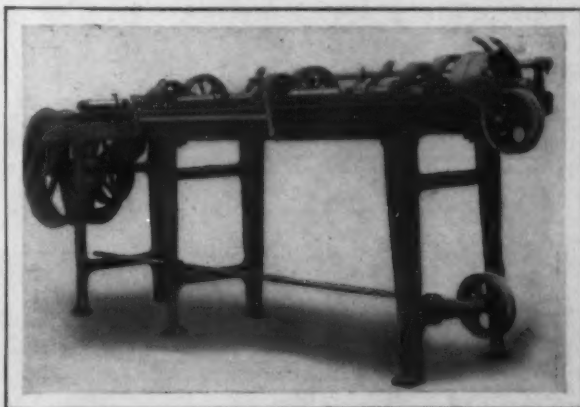
The spindle which is of crucible steel runs in hard bronze boxes and has a tapered end 3 in. in diameter for face milling cutters as well as a No. 11 Brown & Sharpe taper hole for cutter shanks and arbors. It is mounted in a saddle on the cross rail which has a cross feed of 22

the face milling cutters on the end of the spindle and a hole for this bolt extends through the center. The front bearing is 3¼ in. in diameter and 4½ in. long and has compensation for wear. The length of the rear bearing is the same, while the diameter is slightly less, being 29/16 in. The distance from the end of the spindle to the top of the table when the latter is in its highest position is 36 in.

The machine is driven by a 5-in. belt, running over 14-in. tight and loose pulleys on the countershaft which rotates at a speed of 265 r.p.m. From the countershaft a 4-in. belt and a four-step cone pulley transmit power to the spindle. The diameter of these steps ranges from 14 to 24 in. The weight of the machine is approximately 13,000 lb.

A New Wire Wrapping Machine

For winding round, square and flat copper wire, Chas. J. Brooks, 15 Wooster street, New Haven, Conn., has recently brought out a new type of wire wrapping ma-

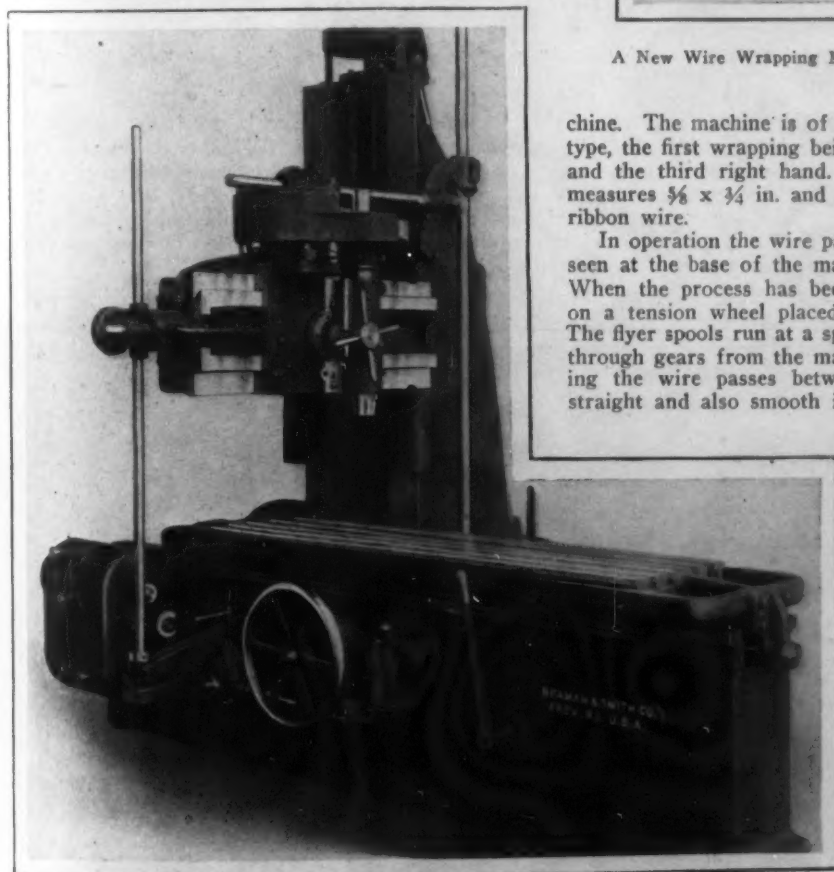


A New Wire Wrapping Machine Built by Charles J. Brooks, New Haven, Conn.

chine. The machine is of what is known as the triple winder type, the first wrapping being right hand, the second left hand and the third right hand. The largest size of wire handled measures ⅝ x ¼ in. and is what is commonly known as flat ribbon wire.

In operation the wire passes from the reel under the pulley seen at the base of the machine and over the pulley above it. When the process has been completed the product is wound on a tension wheel placed at the other end of the machine. The flyer spools run at a speed of 2200 r.p.m. and are driven through gears from the main driving shaft. After each winding the wire passes between wooden blocks which keep it straight and also smooth it in an ironing process.

The American Shipbuilding Company, Cleveland, Ohio, has closed a contract with the Standard Oil Company for two oil boats for 1913 delivery. One will be a steamer with a capacity of 800,000 gal. and the other a barge with a capacity of 1,000,000 gal. They will be constructed on the Isherwood system and each will be 260 ft. over all, or the Welland Canal size. Both boats will be built at the Lorain yards. This contract makes 10 vessels for which the Standard Oil Company has placed orders with the American Shipbuilding Company in less than two years.



The New No. 1 Vertical Spindle Milling Machine Built by the Beaman & Smith Company, Providence, R. I.

in. An independent adjustment of 6 in. and a horizontal movement of 22 in. on the overhanging arm are provided for the spindle. Eight spindle speeds ranging from 14½ to 140 r.p.m. are available through gearing in the ratio of 3 1/5 and 10½ to 1. A retaining bolt is employed for holding

The International Association of Machinists has directed all machinists arriving in New York and vicinity for the purpose of erecting, installing or repairing machinery, to report at the office of the business agent of the district lodge before starting on a job.

Pennsylvania Tunnel Ventilation

Details of the System and the Apparatus Employed to Change the Air in the North and East River Tubes

BY B. W. BENNETT, BROOKLYN, N. Y.

At the time of building the Pennsylvania Railroad Terminal in New York City, the ventilation of the $15\frac{1}{2}$ miles of tunnels leading from the station at Seventh avenue and Thirty-second street, under the North River to Homestead, N. J., and under the East River to Long Island City, as well as below the entire width of Manhattan Island, was considered a matter of prime importance. In the design of this system two main factors had to be considered. It was absolutely necessary that sufficient ventilation be supplied to make the tunnel safe under all emergency conditions, and it was also highly desirable that such a standard of purity be maintained that passengers would suffer no discomfort during times of normal operation, due allow-

that is placed 755 ft. from the entrance and blows toward the west end of the tunnel. A further advantage obtained by using the system is the absence of obstructing duct work in the tunnels, the side benches being left entirely free for walkways. The ducts leading from the fans to the various nozzles were designed to suit local condition in each case, particular attention being paid to the elimination of sharp bends, the presence of which would result in losses due to friction. Care was also taken that there should be no abrupt changes in the cross-section of these ducts, as these would result in sudden changes in the velocity of the air and a consequent loss due to conversion and eddy currents.

A diagram of the tunnel layout and the ventilating system is given in Fig. 1. The upper portion shows the layout of the system extending from the Hackensack portal near Homestead, N. J., to the terminal area at Tenth avenue, New York City, and the lower portion shows the part of the system extending from the terminal area at a point between Sixth and Seventh avenues, New York City, eastward to Long Island City. The direction of the flow

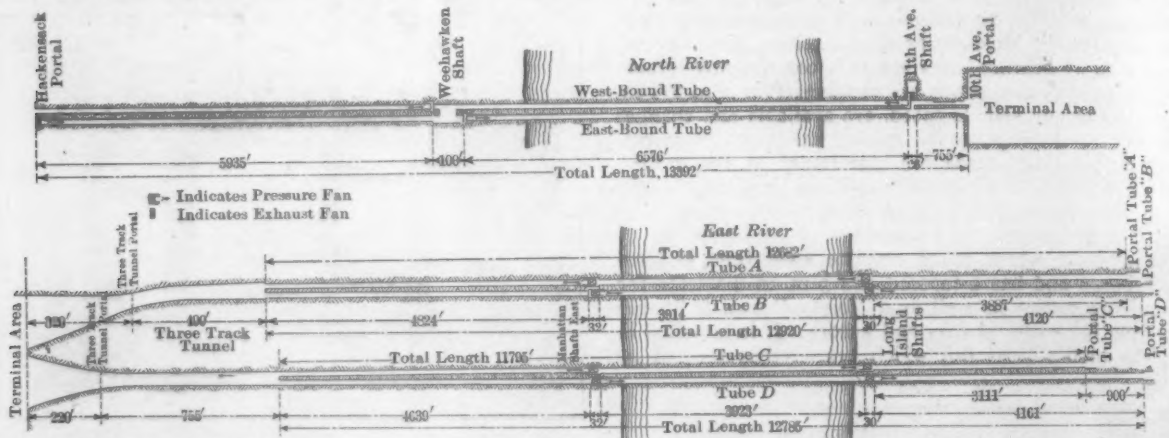


Fig. 1—Diagram of the Ventilation System Installed in the Pennsylvania Railroad Tunnels Under the North and East Rivers by the American Blower Company, Detroit, Mich.

ance being made for occasional irregular spacing of the trains. To obtain these results it was decided to maintain a standard of purity in the cars of not more than 8 parts of carbon-dioxide in 10,000 parts of air. This was equivalent to supplying 30 cu. ft. of air per minute to each passenger, and in the case of the East River tunnels was equal to completely changing the air approximately every 20 minutes. To insure the full amount of air would be supplied to the occupants of the cars, it was decided to deliver to the tunnels 50 cu. ft. of air per minute per person, or two-thirds more than was actually required to maintain the desired standard of purity.

The first and most important feature to be considered with respect to the ventilating system was the general layout and various systems for obtaining the requisite ventilation by exhaust or by pressure or by a combination of both were considered. After due consideration the one found to be best adapted to local conditions was a forced draft system of the same kind that is used for ventilating railroad tunnels through mountains. Here the air is introduced in a stream of constant flow through a divided nozzle which delivers it on each side of the tunnel through evase or expanding outlets placed in the bench walls. These outlets direct the flow of air in the direction of the traffic in the various tunnels and after installation it was found from a test that a decided injector effect was obtained by the use of these special outlets. The effect was so pronounced in the case of westbound tunnel under the North River that a strong current of air was induced which flowed from the Tenth avenue portal toward the fan

of air from the various fans in each case is the same as the direction of the traffic in the individual tunnels and is indicated by arrows. The tunnels are constructed so that each tube is entirely separate from the others, thus preventing the by-passing of air between the tubes which has proved detrimental in the case of the London subways and other installations.

After the volume of air required for the various sec-

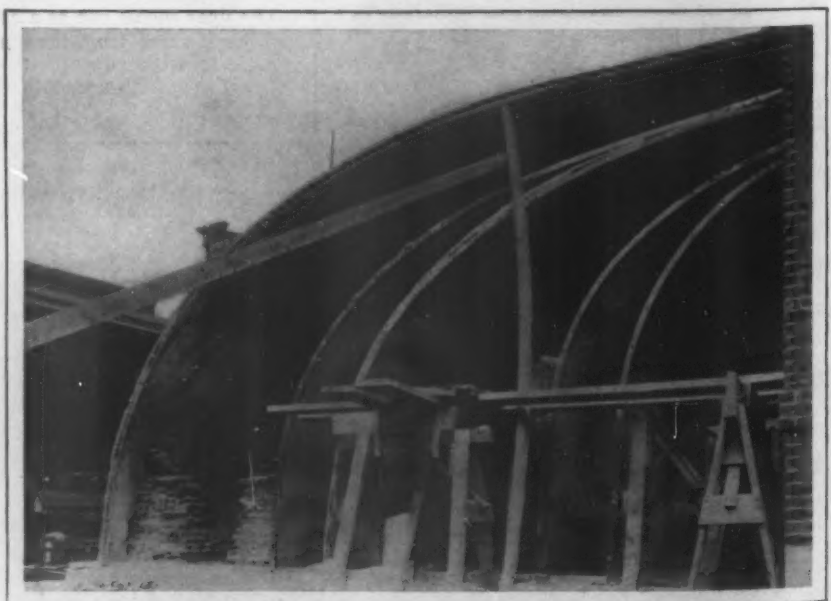


Fig. 2—Discharge Ducts of One of the Double Inlet Pressure Fans in Course of Construction

tions of the tunnels had been determined by the engineers of the Pennsylvania Tunnel & Terminal Company the plans of the tunnels, shafts and fan houses were sent to the fan manufacturers with a request for recommendations

and proposals for the fans to deliver the required volume. There are fourteen fans in all, twelve of which are used as supply fans, the other two being exhausters. These are located at First avenue, New York City. One of these is designed to draw the air from the terminal area through tubes C and D, while the other is intended to prevent the vitiated air from tubes A and B from being blown up into the station proper. A view of a portion of the discharge ducts leading from one of the pressure fans at this point is given in Fig. 2.

The fans used are the Sirocco fans and are adapted to this work by reason of the relatively small space occupied by the fans for a given volume of air and their high efficiency. These fans have wheels of the multi-blade drum type, and some are of the double-inlet type, while others are single-inlet fans. The diameters of the wheels vary from 54 to 72 in., two of the latter size being used and located at the First avenue shaft. The fans are all belted to induction motors and are equipped with three-step cone pulleys, by which speeds of 70 and 40 per cent. of the maximum can be obtained.

After the installation was completed tests of all the fans were made by the engineers of the Pennsylvania Tunnel & Terminal Company and of the American Blower Company, who furnished the fans. Anemometer tests in the tunnels showed that the average air velocity due to the operation of the fans alone was about 8 miles per hour, but this was increased to as high as 30 miles per hour due to the piston action of the trains.

The Question of Standard Flanges

A circular regarding standardized flanges for valves and fittings is being distributed generally to users of valves and fittings by the Committee of Manufacturers on Standardization of Fittings and Valves, W. H. Douglas, secretary, 30 Church street, New York City, asking the recipient not to order flanged fittings under the 1912 U. S. standard. This is a standard recently promulgated under the joint recommendation of the American Society of Mechanical Engineers, the National Association of Master Steam and Hot Water Fitters and the American Society of Heating and Ventilating Engineers. A list of 48 companies, members of the Manufacturers' Standardization Committee, is appended to the notice, which states that the 1912 standard does not compare with the one in general use by the manufacturers, and that, on the other hand, the manufacturers' standard compares favorably with the table of dimensions of the standards for high-pressure lines issued by the Society of German Engineers in 1900, and with the report issued by the Engineering Standards Committee on British standard tables of pipe flanges. It is stated also that the committee has presented a proposed standard to the committees of the American Society of Mechanical Engineers and the National Association of Master Steam and Hot Water Fitters.

H. G. Scott, superintendent of motive power, Interborough Rapid Transit Company, New York City, who was also chairman of the committee of the American Society of Mechanical Engineers having this work in charge, and Calvin W. Rice, secretary of the society, both state that there is no intention on the part of that society's committee to reconsider the flange standards for valves and fittings. In the year and a half in which the question was considered all interested, it is explained, were invited to participate, and a number of manufacturers have, indeed, offered to supply valves and fittings to the 1912 standard. Among others, different departments of the United States Government have adopted the standard.

It has been reported in the daily press in the past week that the Bethlehem Steel Company has taken a contract to furnish the American Locomotive Company with 1000 tons of locomotive steel castings a week for five years, or a total of 260,000 tons. Official denial has been made of this report. It is stated, however, that the Bethlehem Steel Company has for a long time been supplying steel locomotive frames and other castings to the American Locomotive Company and is still furnishing such castings under contract.

The Glasgow Iron Company, Pottstown, Pa., put in operation last week seven puddling furnaces which have been idle for several months.

Use of Water in Deforming a Steel Pipe

An interesting picture was recently obtained of some of the work in progress in connection with the construction of the new water supply for New York City. This shows a portion of a steel pipe line 9 ft. 9 in. in diameter where in dipping across a valley it passes underneath what is known locally as the Harlem Railroad. The photograph is reproduced as supplementary to the two views shown in *The Iron Age* of February 29, explaining in some detail the character of the steel syphons for the water supply extension of New York. In the article mentioned it was explained how the pipe line was put under pressure equivalent to that to which it will be subjected in use so that in providing for the cement and other coating, as well as the saddles or supports, the steel work would take the shape that it will ultimately have. The accompanying cut shows the use of a dead or temporary end so that the pipe line up to the point could be filled with water. A small stand pipe 7 ft. high is shown rising from the top of the pipe and extended over to carry off the discharge, the stand pipe allowing for the escape of air in filling the section subjected to hydraulic pressure, and providing for the escape of the surplus water when the entire section is filled.

The picture is an indication of one of the many uses for pumps required in a work of this character. In many



The 9-Ft. 9-In. Pipe Rigged for Maintaining Pressure

cases in the work shafts had to be driven and these frequently tapped water bearing strata and many interesting construction problems were solved in taking care of the underground water. In one case a 500 ft. shaft was flooded six times during construction and a special pumping chamber had to be provided at one side of the shaft at a point about 300 ft. below ground surface. The magnitude of the problem in this case is indicated by the fact that this pumping plant included three horizontal condensing pumps of a combined capacity of 1050 gal. per minute, supplied by the A. S. Cameron Steam Pump Works, New York City, and requiring steam from three 100 h.p. boilers located on the surface.

It is asserted that a large number of the ships now being built in Europe are for Panama Canal trade routes.

Examples of Concrete Factory Buildings

Some Details of Construction and Design of the Modern Utilization of Poured Concrete in Connection with Light Steel Rods

To give an insight into the general character of a particularly modern form of factory building, some photographs of recent work in reinforced concrete construction are herewith produced. The particular pictures illustrate what is known as the mushroom form of reinforcement, but this term is descriptive of the arrangement of some of the reinforcing rods, and like most of the concrete factory construction involves placing the fresh concrete around the rods and within timber or sheet metal forms. The first illustration shows the assemblage and interlinking of the vertical rods and the circular hooping at the head of the columns and also, of course, the distribution of reinforcing rods for the floor slabs; and the second and third illustrations show interiors and the expanding top of the columns which indicate the use of the mushroom form of reinforcement, the term being specifically descriptive of the design.

The last picture is reproduced to show in part the character of form work provided for holding the con-

slab reinforcement. The hoops are placed about 2 in. inside the concrete and the vertical rods are inside the hooping to which they are wired. At least four vertical rods ranging from $\frac{3}{4}$ in. in diameter up are used and ordinarily eight are employed. The hoops are of $\frac{1}{4}$ -in. to $\frac{1}{2}$ -in. material and are spaced $1\frac{1}{2}$ in. to 3 in. apart. The rods used in forming the mushroom heads vary from $\frac{3}{4}$ in. to $1\frac{1}{4}$ in. in diameter. The mushroom heads before being put in place are bound together on the ground in rigid form. The regular slab reinforcement consists of two straight belts and two diagonal belts of rods in each panel. These rods range from $\frac{5}{16}$ in. to $\frac{3}{8}$ in. in diameter, their size and distance apart depending on the size and character of the structure. It is understood that the vertical column reinforcement is depended on to resist flexure and the hoops serve to prevent swelling and leave the shaft and column free and unobstructed so that there will be no possibility of the columns not being filled with solid concrete. The mixture employed is commonly one part cement, two



Mushroom Heads and Floor Reinforcement, Bovey Building, Minneapolis

crete while setting, and also to show an interesting combination of concrete columns and girders with the curtain or panel walls of brick. While it is not known that it is the case in the instance of the factory building shown, it is easy to imagine a situation in which the strength of the structure may be economically obtained by a reinforced concrete frame work and the cost otherwise minimized by the use of the brick work, although no little satisfaction is expressed with regard to the attractiveness of the façade of a combination of brick and concrete as exhibited in this particular building. In this respect the building is differentiated from the more common type of reinforced concrete building in which the entire exterior is of concrete with a cement surface of uniform color and such breaks in the continuity of the surface and resultant improvement in appearance as obtained by sunken window panels and the like.

The first picture shows the reinforcement work being placed for the second floor of the Bovey Building in Minneapolis, Minn., and illustrates, as stated, typical mushroom heads over the columns and the interlacing of the floor

parts sand and four parts stone for both the slab forms and the columns.

The interior views show the absence of girders or beams breaking up the continuity of the ceiling. One of these is a view on the second floor of one of two similar buildings of the Standard Oil Company in Cleveland, 72 x 302 ft. in size, built for the manufacture of tin cans and designed to accommodate a considerable amount of machinery. The buildings are designed to carry a live load of 300 lb. to the square foot and were tested to a load of over 600 lb. to the square foot. The columns are 16-in. square, placed 17 ft. 10 in. on centers. The exterior walls are also of brick curtain construction, 9-in. thick of shale brick. The windows are Detroit-Fenestra metal sash and frame, made by the Detroit Steel Products Company, and they are glazed with wired glass. The second story has a monitor, as shown, extending the entire length. This is constructed of light steel trusses resting on the tops of the second floor columns and carrying channel iron purlins and 3 in. reinforced concrete roof slabs. The monitor windows are



Second Floor of One of the Standard Oil Company's Buildings at Cleveland

also Detroit-Fenestra, fitted with wire glass and hung in batteries with an operating device for units 60 ft. long.

The construction of the floors is somewhat out of the ordinary. Finished floors are composed of 1-in. tar-sand fill, on which 2 in. yellow pine planks are laid, this being done while the tar is hot, and then a finished surface of $1\frac{1}{4} \times 3$ in. maple flooring with square edges. The square edged flooring was used with the belief that it would not chip off under trucking as readily as tongued and grooved flooring. In erecting the floor slabs long inserts of malleable iron were put in for shaft hangers. The openings in the floor as shown in the illustration were left to allow the chuting of cans down to the lower floor.

The roofs of this building are unique in that no roofing was laid on the concrete but the concrete itself was water-proofed. In building the monitor roof, which consists

of a 3-in. slab, Limoida, a waterproofing compound was mixed with the cement. Nothing further was done toward waterproofing the slab except to bring it to a smooth, even finish. The pitch of the roof is $\frac{1}{4}$ in. to the foot. The remainder of the roof is a 7 in. concrete slab with the ordinary mushroom reinforcement, being water-proofed by a cement finish, varying from 4-in. to 1-in. in thickness to provide a slope on the top of the roof slab proper. This finish was also water-proofed with Limoids, the proportion of Limoids to cement being 10 or 15 per cent. The roofs have gone through severe weather conditions. A few small wet spots appeared but these subsequently dried up and the roofs now, as far as it is possible to tell, are regarded as perfectly tight.

The other interior view is that in the wholesale building of Finch, VanSlyck & McConville, St. Paul, Minn.



Wholesale Building, Finch, Van Slyck & McConville, St. Paul, Minn., Showing Effect of Using Corrugated Iron Forms

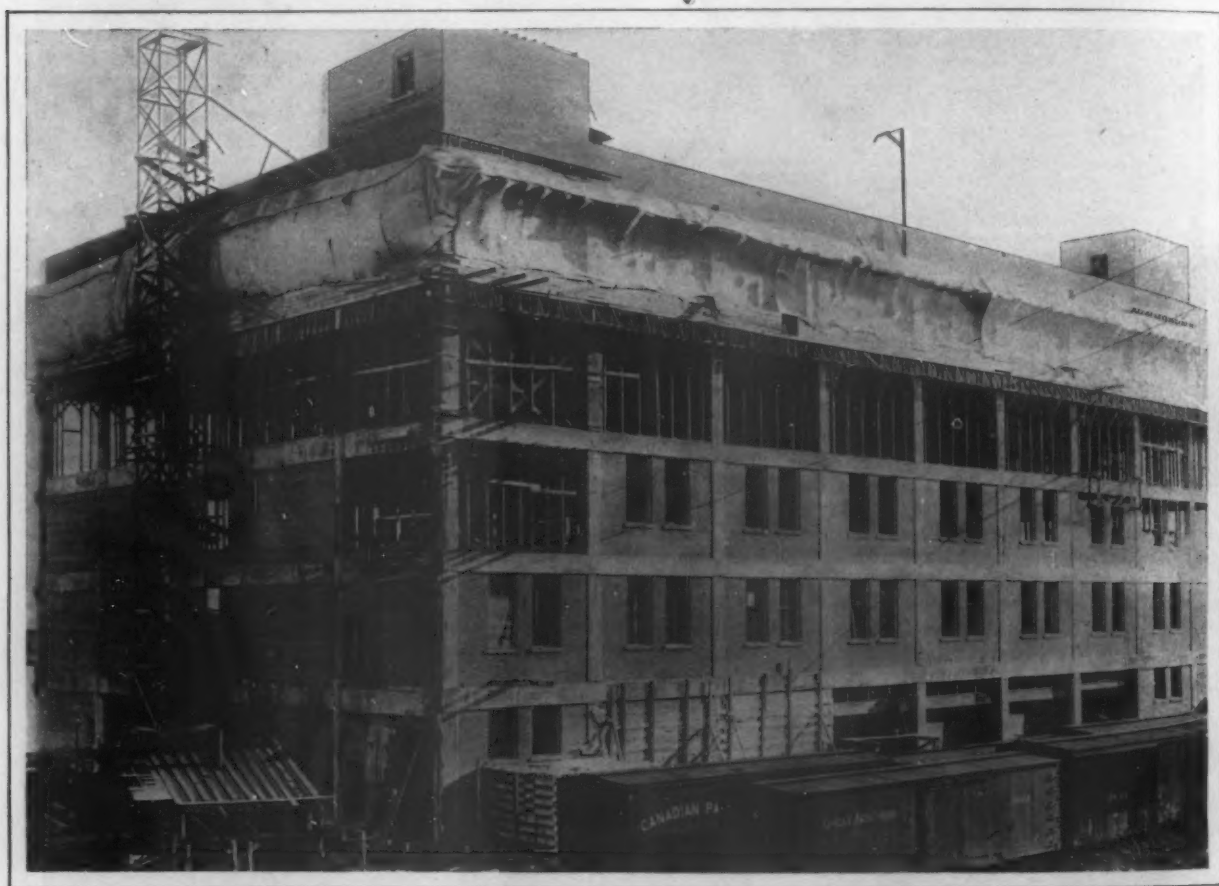
Round type columns are employed and the view is interesting as showing the ceiling effect produced by using corrugated iron forms in building the floor slabs. The exterior view, showing the effect of the brick curtain walls and in the upper stories the general character of wood forms used in this type of construction, is that of a building of the International Harvester Company of America, at Fort William, Canada.

It is, of course, not necessary to emphasize the fireproof qualities of concrete factory buildings, nor to emphasize the economy in factory operation through floor space saving, good lighting and other improvements credited to this type of factory building. Claims for speed of erection are commonly made, particularly for the mushroom system, on the ground that it simplifies the temporary or form work, and reduced cost is also claimed. Incidentally, the absence of beams and ribs are regarded as favoring the convenient placing of shafting, wiring and automatic sprinkler systems as well as giving maximum head room and the possibility of locating partitions at will.

New Line of I-Beams by Carnegie Steel Company

The Carnegie Steel Company, Pittsburgh, Pa., is distributing a pamphlet on beams in which illustrations are given of sections supplementary to the American standard sections. The purposes for which these sections are rolled are referred to by the company in the preface in the pamphlet as follows:

"The present line of American standard I-beam sections was adopted by the Association of American Steel Manufacturers in January, 1896, and experience has shown these sections to be suitable for most of the ordinary uses of bridge, building and car construction. In buildings, however, in order to obtain proper stiffness and to provide for the various types of floor construction, it is frequently desirable to use deeper beams than required by considerations of safe carrying capacity as determined by the specified floor load, with the result that the full strength of the standard beam section is not always developed. To meet these conditions it seems desirable to provide sections of



Building of International Harvester Company of America at Ft. William, Canada

Ordinary mushroom spans are of 10 ft., although they have sometimes ranged from 14 to 30 ft. It is stated that maximum economy in construction is obtainable with the mushroom type in buildings running from two to eight or more stories. Buildings of four stories or less in height are usually cheaper when the walls are made bearing walls, while for higher buildings full concrete skeletons with curtain walls are found to cost less than when heavy bearing walls are attempted. A rough estimate of the cost of mushroom construction is given as \$1 and upward per square foot of floor area, including finished floors, plumbing, lighting and elevators.

The buildings illustrated were designed and built by the Crowell & Sherman Company, general contractor, Cleveland, Ohio, Wilbur J. Watson, Cleveland, acting as consulting engineer. The mushroom system is controlled by patents by C. A. P. Turner, Minneapolis.

The North American Smelting Company expects to begin operations next month at its new works in Kingston, Ont.

lighter weight than the standard sections of the same depth. We have, therefore, decided to roll the structural beam sections shown on the pages which follow, and are prepared to fill orders for any or all of them.

"In order to make the range of these I-beams more uniform, we have thought it best to roll one 21 in. deep rather than to furnish a lighter weight of the 20 in. depth and, to meet the demands for a still deeper beam, we have added one 27 in. in depth of the same type as that of the other sections. With the tables of safe loads and properties of the new sections, we have included also, for convenience in designing, tables of the safe loads and properties of a selected range of standard I-beams."

An agreement has been made recently between the representatives of the trade unions of Norway, Sweden and Denmark that, in the event of a strike or lockout involving at least 20 per cent. of the membership of the Federation of Labor of any one of the countries, strike benefits will be paid by the organized workers of the two other countries.

Rock and Ore Shoveling Machine

The use of a new and efficient mechanical shoveling device is the special feature which characterizes the rock handling machine built by the Myers-Whaley Company, Knoxville, Tenn. These machines are built in a number of different types and it is emphasized that they can be practically employed in almost any kind of material shoveling which is now done by hand provided a sufficient quantity is to be handled to get economical results. Among the special lines for which this machine is adapted are the loading of coal or other material from the floor into pit cars, to mine ores and other materials in open trench work, to strip the soil from horizontal mineral deposits, to take the place of stock house crews in blast furnace work, to put material into stock piles or to take it from them and to reload it into cars or bins and to excavate rock after blasting. Almost any type of motive power can be used and the machine can be operated by one man. It is self-propelling in either direction at variable speeds and there are track machines and others propelled on traction wheels.

The construction of these machines is made as rigid as possible to withstand the hard usage met with in service. All the cast parts are of steel and wherever possible forgings have been used. All the gears except the bronze spirals are high carbon steel with accurately cut teeth and are housed in oil-tight cases wherever possible. Standard ball bearings are used to take the end thrust and roller bearings are used on the conveyor shafts. The conveyor

The conveyor at the front end can be turned to make an angle with that at the rear which has a vertical movement of about 10 ft.

Iron Ore in Mississippi

At a meeting of the Mississippi Geological Survey at Jackson, Miss., May 2, a report on the iron ore deposits in Marshall and Benton counties in that State was presented by Director Lowe. Attention was first directed about three years ago to these deposits in the vicinity of Potts Camp on the Frisco Railroad in Marshall County. Dr. Lowe had made a surface examination of three areas, designated as Potts Camp, Winborn and Hickory Flat. In the first named three ledges of carbonate ores were found, 8, 14 and 20 in. in thickness. In all three areas another stratum of ore was found, 6 to 8 ft. thick and 20 to 30 ft. below the surface. Dr. Lowe estimated the ore in sight, available at a cost not to exceed \$1 a ton on board cars, at 500,000 tons. Other estimates run up to 1,500,000 tons. A shipment of 25 carloads was made in the fall of 1911 to Birmingham and satisfactory reports were made by furnaces there.

Analyses made by W. L. Pardue, of the Mississippi State University, show the following average content for the oxide ores: Metallic iron, 49.53 per cent.; manganese, 8.69; sulphur, 1.38; phosphorus, 0.057; silica, 18.88. The carbonate ores averaged 62.15 metallic iron, 5.77 manganese, 0.87 sulphur, 0.122 phosphorus and 13.345 silica. Calcining increased the percentage of metallic iron. Dr.



A Mechanical Shovel for Rock, Coal, Etc., Built by the Myers-Whaley Company, Inc., Knoxville, Tenn.

chains are of the steel roller type with bronze bushings and specially designed attachments. The drive chains are of finished nickel steel and run in oil-tight cases wherever possible.

The lubrication of the machines has received careful attention, pressed steel compression grease cups being used for most bearings with sight feed oil cups for the two which it is impossible to lubricate with grease. Brass and white metal linings are provided in many bearings and the machines handling rock or other abrasive material have dustproof bearings.

In operation the shovel at the right end of the machine is forced under the material to be handled by the forward movement of the entire machine and when filled tilts back and discharges its load upon a conveyor which can be seen discharging rock upon a second one at approximately the center of the engraving. This second conveyor carries material backward and discharges it as shown upon a car or other vehicle.

One of the special machines built by this company is of the turntable type and will swing through a complete circle. It is especially adapted to stockyard work and can be used for loading material from wharves into railroad cars or upon stock piles or reverse the operation and take the material from stock piles and reload it into cars.

Lowe's report was optimistic as to the commercial importance of the iron ore deposits of Mississippi, based on the results of the limited explorations thus far made. One company, incorporated in New Jersey, owns 15,000 to 20,000 acres and another has had representatives in the field for several months.

The transportation by the Northeastern Railroad in England of the cast steel stern frame and shaft brackets for the 50,000-ton Cunarder Aquitania, was accomplished Sunday April 28, when ordinary traffic on the railroad had to be suspended for several hours. The wing of the stern frame projected 10 ft. 10 in. over the car side on one hand and 5 ft. 6 in. on the other. The distance from the rail level to the top of the load was 13 ft. 6 in. The main piece of the stern frame weighs 30 tons; the forward bracket 35 tons; the after brackets 33 tons, and the stern frame and brackets together weigh 130 tons.

The total number of Pennsylvania Railroad stockholders on April 30 was 73,790, as compared with 73,693 on March 31. The April figures record the largest number of stockholders ever reported. Of the total 47½ per cent. are women, 14 per cent. of the stock is held abroad, 17 per cent. in New York and 31 per cent. in Pennsylvania.

A 26-in. Cold Sawing Machine

Two of the chief points of interest about the new 26-in. universal cold saw cutting-off machine designed and built by the Newton Machine Tool Works, Inc., Twenty-fourth and Vine streets, Philadelphia, Pa., are the use of a table construction to facilitate quick changing and clamping of the work and the development of a solid high-speed saw blade with a hardened center and flexible rim. The use and arrangement of the table construction, which includes a main and an auxiliary table, are clearly brought out in the accompanying engraving.

The table construction consists of a base on which the main or bottom table is located. This table is 47½ in. long, 36 in. wide and four T slots running the full length of the table and designed to accommodate 1-in. bolts are planed in its top. A rack is cast down the center of the table to facilitate the adjustment of the top or auxiliary table, which is 33 in. wide, 31½ in. long and 13 in. deep. The bottom table has a hand in and out adjustment to facilitate the setting of the work to the exact length. Heavy box type construction is employed for the auxiliary table, which also has four T slots planed in the top to accommodate 1-in. bolts. In operation the top table is held securely to the lower one by four bolts, while an auxiliary V-block for holding round sections is held in position on the main table by two heavy bolts, as illustrated at the right of the engraving. The clamps illustrated in connection with the work on the machine are all separate castings and can be located in position at will. The I-beam section which is being cut is shown in a flat position, which is the one utilized when it is necessary to make angular cuts or where the section is too large to be handled by the regular equipment. Special provision is made for supporting angle and channel sections against the side of

In designing these machines it was intended that the best obtainable blades be driven at their maximum efficiency, the rate of speed being limited only by the strength of the individual saw tooth. The maker advocates that the work be clamped in such a position that the shortest possible length of travel necessary to make the cuts is secured. With that end in view, I-beams, channels and similar work are cut in a standing position, since that presents a broader surface for cutting and more saw teeth can be engaged, which, it is pointed out, greatly aids the successful operation. In a number of cases structural shapes will not permit the engaging of more than one tooth at a time, and to overcome this a solid saw blade with a hardened center and flexible rim has been developed. With this blade 15-in. I-beams in a vertical position have been cut off in 2 min., and 5½-in. 0.30 per cent. carbon steel bars sawed in the same time. In actual practice machines are cutting off two 7-in. channels simultaneously in 3 min. and two 10-in. channels in 4 min. without taxing the capacity of the machine. The capacity of this machine is round stock having a maximum diameter of 7½ in. in one cut and for 15-in. I-beams in a vertical position for either square or mitre cuts. Structural shapes and equivalent oblong sections up to 7 in. high by 24 in. long can be accommodated on the top table. If desired, the machine can be fitted with a cutter head 20 in. in diameter over the tools when there is a capacity for rotary planing the ends of sections 17 in. high and 30 in. long.

Lignite Makes Good Briquettes and Producer Gas

The University of North Dakota has been conducting some interesting experiments on the utilization of lignite for gas-making and in the manufacture of briquettes. A

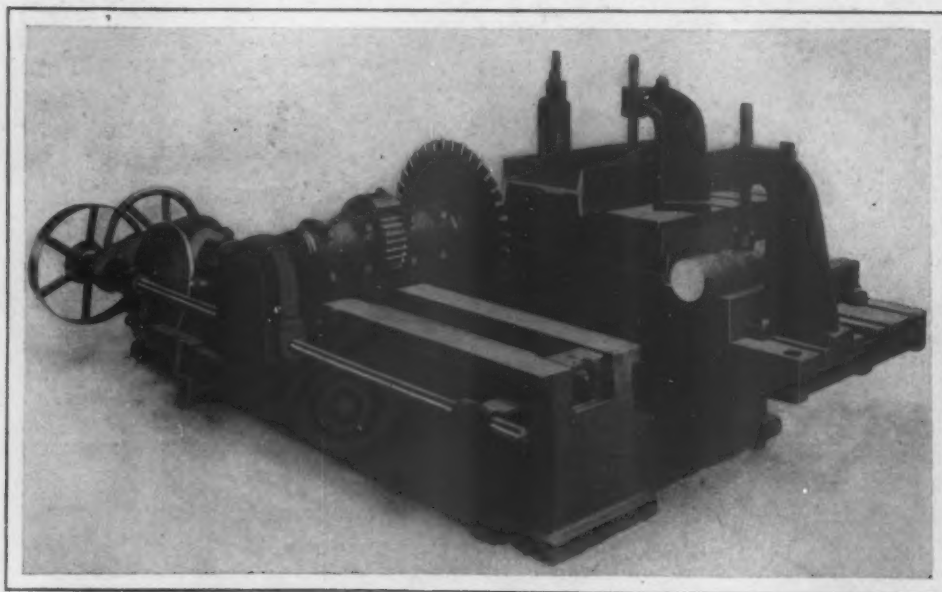
plant operated by the School of Mines of the University has been located at the mining substation at Hebron. In a letter to the United States Geological Survey dated April 23, 1912, Prof. E. J. Babcock, Dean of the College of Mining Engineering, says:

"We are doing a very large amount of research work at this plant on the use of various binders, the best methods of preparing the coal, as well as the best methods of mixing and pressing. We are improving our plant and enlarging it at the present time, so as to get data more nearly approaching those of a commercial plant. Thus far we have made but small quantities of briquettes,

but by the methods which we are working out we have gotten very excellent results.

"The briquettes are of high grade, stand well in the fire and on exposure to atmospheric agencies. They are of high heat value, being raised from 7500 to 7800 in the raw lignite to about 12,000 B.t.u. in the finished briquettes. After the improvements are completed which we are now making our experimental plant will be able to run uniformly at a rate of 10 tons per day. We operate a gas plant in connection with the lignite plant, thereby generating gas from lignite and briquetting the residue. This residue gives a high heat unit briquette.

"We condense about 1½ tons of raw lignite into 1 ton of briquettes in this manner. The gas and other by-products are saved. We derive approximately 10,000 cu. ft. of 400 B.t.u. gas per ton of reasonably dry lignite. We have tried a great variety of binders and methods."



The New Universal 26-In. Cold Saw Cutting-off Machine Built by the Newton Machine Tool Works, Inc., Philadelphia, Pa.

the auxiliary table to secure rigidity and also for holding angles so that both legs are cut at one time, and the length of travel is therefore less than the altitude.

The general design of the machine follows the Newton standard. The spindle, which has a length equal to the diameter of the saw blade, revolves in capped bearings and the driving pinion is mounted between the bearings and covered to prevent accidents from chips, the teeth of the pinion being cut from a solid worm wheel shaft. The driving worm is a solid bronze casting and the worm wheel is of hardened steel with roller-thrust bearings. Continuous friction or geared feeds having six changes are furnished. The saddle has an automatic release to the feed and power quick return, available in both directions on motor-driven machines by using a reversing motor and double-throw switch. The spindles are finished by grinding and the saddles are hand scraped, the adjustments of the latter being made by taper shoes.

The Shear-Klean Grate

Ability to act upon every inch of the bottom of a fire and to eliminate the ash and clinker in horizontal layers are two special features of the Shear-Klean grate, which has been recently placed on the market by the Shear-Klean Grate Company, Monadnock Block, Chicago, Ill. Two motions instead of one are also used in this grate. The first is that of rocking all of the grate bars by simply moving the operating lever through a short arc. By pushing the operating lever in front of the boiler to a greater distance after the rocking motion has been given to all of

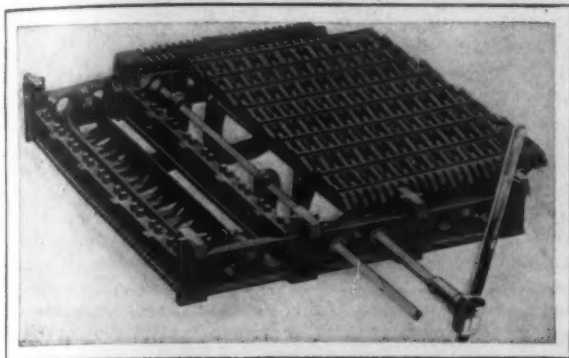


Fig. 1—A New Type of Shearing and Rocking Grate Made by the Shear-Klean Grate Company, Chicago, Ill.

the bars, each alternate grate bar is shifted sidewise in both directions, thus grinding and crushing the clinker above it. As the fingers of the grate bars interlock when the shifting of the alternate bars has been accomplished, the openings between the grate bar fingers have been increased in area, thus allowing the broken clinker and ash to pass through into the ash pit. It is pointed out that by grinding out the bottom only of the fuel bed no unburned fuel is wasted by being dropped into the ash pit. The space between the grate bars in their normal position at the right of Fig. 1 is $\frac{3}{4}$ in. for bituminous coal which is doubled when the shearing motion is completed as shown at the left of the same engraving. The grate bars in addition to cleaning the fires it is pointed out clean themselves in their ordinary operation and in this way it is practically impossible for any clinkers to form on this grate. It is also impossible for the operator to leave the grate fingers sticking up into the fire and burn off.

The frames of the grate are fastened together at the ends by separators which are rabbeted to them, this arrangement making a solid construction. These separators serve a double purpose as they also act as bearings for the square steel shafts which transmit the force applied to the operating lever to the grate bars. This arrangement is clearly shown in Fig. 2. No bolts are used in the construction of this grate, their place being taken by pins and

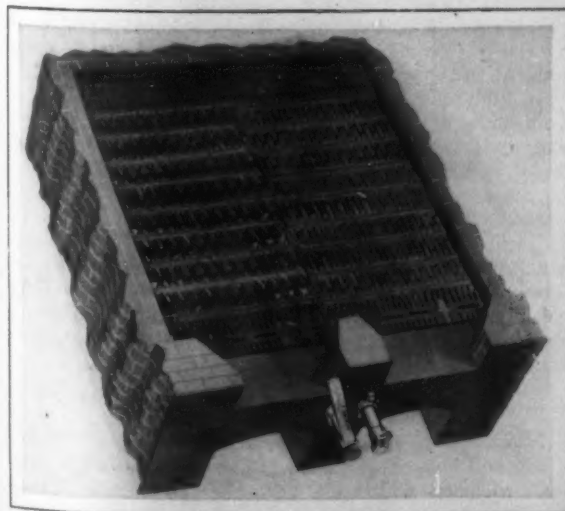


Fig. 2—View of the Grate with the Bars in the Extreme Shearing Position

set screws. It is emphasized that the grate bars cannot get out of place as they are set in V-shaped grooves 1 in. high and the $\frac{3}{4}$ -in. hard steel pins which are set into it are actuated by the cam slots of the operator and project for a considerable distance beyond it, thus eliminating the possibility of their getting out of place. In this grate the frame is 4 in. below the fire and the grate bars which form the entire top of the grate are supported by the frame.

Brooklyn-Staten Island Subway Proposed

Subway plans that will change the railroad map in the vicinity of New York City and, if carried out, make of Staten Island an important railroad center, were made known last week by the Public Service Commission. The scheme proposes a through route for both freight and passenger traffic via the new tunnel under the Narrows agreed upon by the subway conference May 14, between Sixty-fifth street, Brooklyn, and a point near Arrietta street, Staten Island, with spurs to St. George and Stapleton. This plan will give the railroads which now have terminals in Staten Island a route to the East via the New York Connecting Railroad, which will have a terminus at Sixty-fifth street, Brooklyn, and shortly will be carried by bridge over the East River to a connection with the New York, New Haven & Hartford.

The Baltimore & Ohio, the Philadelphia & Reading and the Central Railroad of New Jersey now have a bridge across the Kill von Kull by which freight cars are taken from New Jersey to Staten Island. But from Staten Island the freight cars have to be transferred to floats or lighters. Staten Island is thus far of no use whatever to the steam railroads for through travel from Boston to the South or from the South to the Northeast. For the purpose of accommodating both freight and passenger cars of the steam roads it will be necessary for the tubes to be a little larger than those now used by the Interborough Company in crossing under the East River. The present tubes of the city's subway have a clearing of 13 ft. 2 in., but the Staten Island tubes will have to have a clearing between the tracks and the roof of the tunnels of at least 15 ft.

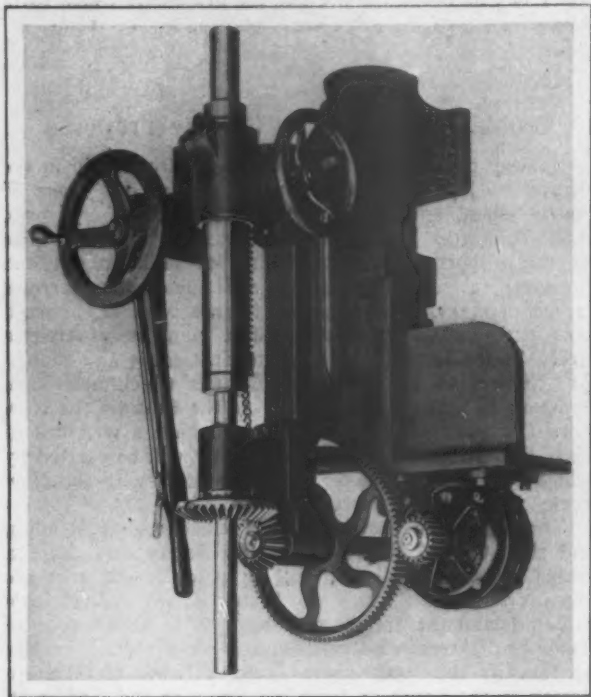
Another important part of the plan to project tubes from Brooklyn to Staten Island is that the city may thus be enabled to reduce the cost of running water mains from Brooklyn to Staten Island. The water department has already planned to lay water mains across the Narrows, so that Staten Island may have the benefit of the municipality's augmented water supply. The plans for the Staten Island tubes contemplate their accompaniment by water mains 48 in. in diameter. The railroad tubes with their 15-ft. clearance will be run side by side. Between them, in the space at top and bottom, the water mains will be run. Then the two railroad tubes and the two water mains will be cemented in an almost solid block of concrete.

Motor truck performance in a New York pier has been studied by George W. Brown, who recently gave the figures to the New England Railroad Club: Two trucks, operating 11 hr. a day for 26 days, averaged for the two trucks 13.6 miles per day, and moved 225 tons with a total daily average of 230 loads. The average haul was 158½ ft. The average amount of freight carried per hour for the two trucks was 20.3 tons. The number of pieces per load averaged 29.8 and the average weight per piece was 88.5 lb. The average time of loading was 58 sec., the average time of unloading was 60.3 sec. and the total average time for one round trip, including loading and unloading, was 2.89 min.

A convenient finder of decimal equivalents of common fractions from $\frac{1}{64}$ to unity by sixty-fourths has been prepared for distribution by the Standard Roller Bearing Company, Philadelphia, in the shape of a handy celluloid device. The equivalents are given in six decimal figures. The finder is arranged so that only the equivalent desired is visible. One side of the device gives a picture of the Standard ball bearing and the other a picture of the Standard roller bearing.

Overhead Drilling Machine

A new type of overhead motor-driven drilling machine has been put on the market by Boynton & Plummer, Inc., Worcester, Mass. Although the machine is especially designed for use by automobile and tire manufacturers for



The New No. 15 Motor-Driven Drilling Machine Built by Boynton & Plummer, Inc., Worcester, Mass.

drilling chasses, rims and wheels and other similar purposes, it can be mounted on a post or crosshead and will accommodate work of any character and dimensions.

The machine is driven by a $\frac{1}{2}$ -hp. electric motor mounted on a bracket at the top of the machine. The power is transmitted from a pinion on the motor armature meshing with a large gear to the spindle through bevel gears. The spindle can be adjusted vertically on the column and has both lever and handwheel feeds. It is counterbalanced by a weight in the column and is fitted for a No. 3 Morse taper. The length of the machine is 36 in. and the distance from the post to the spindle is 19 $\frac{1}{2}$ in.

Champion Rivet Company to Expand

The Champion Rivet Company, Cleveland, Ohio, has just purchased a 20-acre building site in East Chicago, Ind., and will shortly begin the erection of a large plant for the manufacture of rivets to supply its Western trade. The company expects to buy a full plant equipment except for power, as the factory will probably be operated by electrical power furnished by a commercial company. The company's products consist of boiler, ship, bridge and tank rivets and of air brake and coupling pins. It is the intention to have the new plant of sufficient capacity to give employment to between 300 and 400 men. Wilson B. Chisholm is president of the company, David J. Champion is vice-president and Henry Chisholm is secretary and treasurer.

The Manitoba Bridge & Iron Works, Ltd., Winnipeg, has secured an option on 30 acres as a site for a bridge building plant in North Transcona, Manitoba. The property in question lies east of the new Canadian Pacific yards at North Transcona and is at the junction of the lines of the Canadian Northern and Grand Trunk Pacific. T. R. Deacon, president and general manager of the new bridge company, has just returned from Gary, Ind., where he has been inspecting the plant of the American Bridge Company. He was accompanied by H. A. McKay, his chief engineer. The first building to be erected will be a bridge shop, 90 x 160 ft., and the other buildings will be added as rapidly as possible. The plant is to be in operation by January 1, 1913.

Motion Study*

Two Cases of Saving Effectuated by Analyzing Operations in Machine Shops

BY CHARLES S. MILLER†

Motion Study is a valuable and useful instrument to use in performing the operation of cutting costs. It is also a dangerous instrument, this on account of two principal reasons:

1.—It takes time to make motion studies, and a great deal of money can be very quickly spent in making observations which may develop later as having little or no practical value.

2.—Unless the workmen are handled right, they are apt to get the impression that the studies are being made with the sole purpose in view of cutting rates.

Difference Between Motion and Time Studies

In the mind of the uninformed there is apt to be some confusion between Motion and Time Study. We might say the former is qualitative and the latter quantitative. Motion study analyses determines the proper elementary motions necessary to accomplish a certain act. It eliminates all unnecessary motions and determines the arrangement of the work to enable the operator to execute the sequence of motions with the least expenditure of effort and time. It is a motion study that effects savings.

Time study is measure; it determines standards by which we can measure the relative efficiency of the old and new methods. It serves as the basis in setting prices on piece work or the standard time on bonus work. Time study is complementary to motion study. It is necessary so that we may establish standards which must be lived up to by the operator, and these standards can only be reached by operators working under this new method.

Nailing Down New Methods

To the average workman it seems too much trouble to make the effort to break away from the old method of doing his job and working his mind long enough to create brain channels that will telegraph the new motions to his hands. Written instructions, wage incentive, personal direction, and, for a time at least, constant supervision, are all necessary. In the case of much foreign labor the work must be done without the written instructions to the workman. After a time increased wage return, less fatigue and the habit formed of doing the work in the correct way, insure the performance of the operation in the standardized manner. The matter of training workmen in habits of industry, in the doing of their work in the proper manner, has a humanitarian as well as a commercial aspect.

One feature of time study is worth mentioning, though it is opposed to the fundamental principle of mutual confidence between employer and workman; it is practically impossible for an operator to fool an experienced motion and time study man by "soldiering" on a job under observation. Five to ten timings of the elementary motions in an operation, establishing a standard time for each motion, not an average, and summing the unit standard times, will invariably give a fair total time for the complete operation.

In addition to establishing a standard method of accomplishing a job, motion study brings the individual workman under close observation, and this enables the employer to fit the workman to the job. It makes possible the consideration of the personal equation of the operator in selecting him for a certain operation.

I will now give examples of motion study taken from actual practice. Comparatively simple operations have been chosen, both on account of the greater clarity in description and because it is in the simpler operations that often lies the opportunity of greater economy in movement rather than in ones of more complexity.

An Application of Motion Study

Making final sizing cut on taps and gauging diameter of top and bottom of threads. The cut is made on a vertical drill press with a die set in the bed plate and the tap

*From a paper read before the American Supply and Machinery Manufacturers' Association, Norfolk, Va., May 13.
†Miller, Franklin & Co., New York.

is gripped in the chuck and forced down through the die, falling into a pan under the press. The work is gauged in two "pass and stop" gauges placed on the left of the bed of the press. By the old method the unfinished work was in a box on the left of the machine; the finished work in a box on the right. The sequence of motions was as follows:

- 1—Reach 2 ft. to left of box of unfinished work.
- 2—Pick up tap with left hand.
- 3—Bring tap to chuck.
- 4—Slip squared end of shank into chuck with left hand.
- 5—Reach over with right hand and lower head of press, passing tap through die until it falls into pan under press.
- 6—Reach under press with left hand and pick up tap.
- 7—Lift tap from pan to gauges on left of press.
- 8—Pass through gauges.
- 9—Transfer tap from left hand to right hand.
- 10—Put in box of finished work.

Now for the new method. The box of unfinished work was placed closer to the operator and the box of finished work placed beside it on the left side of the press. A small sheet iron chute was placed under the press so the tap would slide to the front when it fell from the die. The right hand of the operator grips the lever of the head continually. A better arrangement would have been to put an attachment on the press, to actuate the head by foot, but this change was not made in this instance.

Starting with the operator gripping this lever with his right hand and his left in the box of finished work where he has just placed his last finished piece, the new sequence of motions is as follows:

- 1—Move the left hand about 6 in. toward the chuck to the box of unfinished work.
- 2—Pick up tap with left hand.
- 3—Bring tap to chuck.
- 4—Slip squared end of shank into chuck with left hand.
- 5—Lower head with right hand, passing tap through die. While doing this with the right hand, execute the following motions with the left:
 - a—Pick up previous tap from pan between knees.
 - b—Lift tap to gauges.
 - c—Pass through gauges.
 - d—Reach to box of finished work and lay down tap.

In this operation a saving of 50 per cent. in the time was effected by the new method. A \$1.50 a day man was sizing about 700 pieces per day, costing the company about 21 cents per hundred. By setting a piece work rate of 14 cents per hundred, the operator was able to earn approximately \$2.00 per day by the new method and the company saved one-third of the direct labor cost of the operation.

Principle Applied to Grinding of Reamers

[Another example explained operations of grinding reamers to a gauge size, there being required two grindings, the roughing and finishing.] The grinding was being accomplished in two distinct operations, the grinder being set first for the roughing grind and a lot of several hundred put through, then changed for the finishing grind and the lot put through the second time. The work was placed in a dog, inserted in the carriage chuck, clamped and the carriage traveled forward and back automatically. During this time the operator took the dog off the last accomplished piece of work, put this piece in a box, picked up another piece of work, put on the dog, then "sat" until the grinding was finished.

By the old method the sequence of motions and the unit time of each motion was as follow:

- 1—Pick up reamer and attach dog.....0.09 min.
- 2—Stop machine, take out and put in work and start machine.....0.13 min.
- 3—Grinding (automatic)0.30 min.
- 4—Remove work from dog and put in box. .0.07 min.

Operations 1 and 4 are accomplished during (3) so that the elapsed time for one cycle of operations was 0.43 min., during which the operator was idle 0.14 min. or 1/3 of the total time. Thirty-three and one-third per cent. rest in this instance was very considerably more than a man required to work without undue fatigue. The problem was how to utilize this idle time—0.14 min. in every 0.43 min.

As two grinds were necessary to bring the reamers to final size, the sequence given above was repeated, the ma-

chine being readjusted after the first lot was finished. It will be noted then that the total time for the two grinds on each piece, exclusive of any time for machine set up or adjustment, personal needs of the operator, etc., was 2×0.43 equal to 0.86 min. As this example is for comparisons of the actual machine time between the old and new methods, the factors outside of this are not discussed here, though careful study would have to be made of same before setting a standard task.

By the new method the operator will be provided with two machines, indicated hereafter as machine R for roughing grind and machine F for finishing grind. The machines should set face to face about 4 ft. apart. Starting at machine R, the sequence of motions and the unit times of same would be as follows:

At Machine R	
1—Pick up reamer and put in dog.....	0.09 min.
2—Stop machine, take and put in work and start machine	0.13 min.
3—Grinding (automatic)	0.30 min.
4—Turn and step to Machine F.....	0.02 min.

At Machine F	
5—Stop machine, take out and put in work and start machine	0.13 min.
6—Grinding (automatic)	0.30 min.
7—Remove dog and put finished reamer in box.....	0.07 min.
8—Step to Machine R.....	0.02 min.

Remembering that operations 3 and 6 are automatic, we find the sum of the time of the other operations to be 0.46 min. for completing both grindings.

The comparison would consequently be as follows:

Old method time per 100 pcs., two grindings.....	83 min.
New method time per 100 pcs., two grindings.....	46 min.
Saving	37 min.
Per cent time saved.....	44½

In this particular case two additional factors must be considered: 1. Will the volume of work be sufficient to bring justifiable returns on the investment in one additional machine. 2. What percentage of time will the machines lie idle between the time the grinding is automatically completed, and the workman gets the machine started again. In this case we find that it takes the workman 0.33 min. to complete his cycle of operations from the time the machine is started until he returns to unload and load the machine. As the automatic operation requires only 0.30 min., there will be 0.03 min. lost on each machine on each operation, or the machine efficiency will be 91 per cent. as compared with the old methods.

Assuming that there is sufficient work to keep both machines busy, that each machine costs \$250 and that 20 per cent. of this cost is the yearly charge for repairs and depreciation, we find the yearly cost of the additional machine to be \$50. A 20-cent an hour man was doing this work. His income, working full time, would be \$572 per year. Deducting 20 per cent. from this as the amount paid for unproductive time, that is, time for setting and adjusting machines, personal needs, etc., and taking 44½ per cent. of the result, we find a saving in labor by the new method of \$210 per year. Deducting the \$50 machine cost, the company would save on this one simple operation \$160 per year, the interest on \$2,667 at 6 per cent.

A Niagara Nursery for Small Industries

The Hydraulic Power Company, Niagara Falls, N. Y., intends soon to break ground for an immense factory building, in the lower milling district, to be used as a nursery plant, a place where small manufacturers desirous of establishing themselves in Niagara Falls can get floor space while they are building up their business to proportions that may require an independent plant, or where inventors may develop commercial processes. The principal industrial drawback to the city has been that there was no place for the small manufacturer. The power companies have sold their current in large blocks and have not encouraged the manufacturer requiring a small amount of power to locate there. Plans for the building are being made by J. Rattray, Gluck Building, Niagara Falls, and it is expected that the work of construction will start within a month.

The Alberta Rolling Mills Company, Ltd., Medicine Hat, Alberta, Canada, recently incorporated, intends to erect a steel plant comprising open-hearth furnaces, a blooming mill, a pipe mill and bolt and nail factories. J. L. Pollock is president and A. L. Scott is treasurer.

THE IRON AGE

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Our Unpaternal Government

Not many years since the several branches of the United States Government vied with one another in endeavoring to advance the business interests of America. The executive department, the majority in Congress and the official representatives of the Government wherever stationed were imbued with the desire of expanding American manufactures and commerce, believing that the whole country was thus benefited. The pendulum has now swung the other way, and various branches of the national Government are as assiduously endeavoring to harass or embarrass our business interests.

The President, under the stress of an apparent political exigency, seems desirous of making a record for himself which will surpass that of his predecessor in curbing big business. He has gone so far as to indulge in intemperate expressions in reference to matters which are the subject of judicial inquiry and should receive the orderly attention of the courts. At Newark, Ohio, May 14, in making a political speech, he was asked by a man in the crowd as to what he intended to do with the United States Steel Corporation and the International Harvester Company, and replied, "I'm going to break them up." Such an assertion would seem to be beneath the dignity of the man in whose hands the people of this country have placed the administration of its affairs and whose highest care should be to treat all interests equitably, leaving to the regular judicial tribunals the handling of questions coming solely under their jurisdiction. The great corporations are still on trial before the people, and it has not yet been determined by sound public sentiment whether it would be better for the country to have these corporations completely disintegrated or to have them brought under Government control. The attitude of the President, however, would indicate that he has decided to show great corporate interests that he has no consideration for them.

The majority now dominating Congress is proceeding in the same reckless manner to handle great business questions. Tariff schedules are proposed which, if enacted into law, would throw important industries into confusion and would seriously dislocate general business. Through ill-advised labor legislation our manufacturing interests would be given over to the mercy of labor agitators, and employers would simply have the privilege of providing the capital to carry on their business and meet the payrolls. All other details would be carefully attended to by the representatives of unions. Another matter in which recklessness is shown is in the handling of questions which affect our relations with foreign countries. The slow methods of diplomacy and the gentle art of persuasion were wholly unsatisfying to the fiery advocates of harsh measures to bring Russia to terms with regard to admitting all American citizens to its passport privileges. A treaty which had existed for half a century was abrogated with no expectation of its replacement by another treaty more acceptable to the citizens of this country. The representatives of the Department of Justice have, the past week, administered an affront to Brazilian interests by their proceedings against the Brazilian coffee valorization committee in New York City.

In neither the case of Russia nor Brazil is there any serious fear of international complications.

Neither act would be provocative of war or lead to the sundering of diplomatic intercourse. There is another consideration, however, which goes beyond such a view of the case and should have been permitted to have its proper weight in embarking upon such proceedings. This is the danger of arousing among the people of both Russia and Brazil a feeling of deep resentment against this country, to be visited upon those of our citizens who have trade relations there. The people of both countries are as sensitive as ourselves and must look upon our action as an unwarrantable interference with their affairs. The trade of Brazil and of other portions of South America is especially desired by this country and has for some time been gradually coming our way in greater volume under careful cultivation by our business interests. The action of our Department of Justice is well calculated to make the people of Brazil and other South American countries turn to Europe to an even greater extent hereafter for their supplies.

The charge has been widely made that the business interests have been running the Government. That this is very far from being the case is shown by the disregard, as above exemplified, of the true interests of American manufacturers, merchants and a great body of the people. It is high time that the forces of the Government were turned from destructive measures. There is a crying need of leaders of construction.

Organization in the Steel Industry

The American Iron and Steel Institute made a distinct success of its second general meeting, held in New York last week. There was no suggestion of any desire or effort to revive the activities which previous to the year of open competition beginning in May, 1911, were a marked feature of the work of the organization. The programme, which consisted largely of papers and discussions on technical questions, welfare work and on trade practices in dealing with which the factor of trade restraint is not remotely involved, is a fair index doubtless of the lines which are to be diligently followed in future meetings. The reduction of the entrance fee to a nominal sum, with dues put on a basis that will bring in in large numbers the men in the operating and other departments of iron and steel companies, appears to be definite notice that market prices and selling policy are not to be in the purview of the Institute.

It can hardly be appreciated how much this organization has already done for the iron and steel trades in the opportunity given its leaders to measure and to respect each other as competitive factors in a great industry and to acquire common viewpoints on some of the important questions with which they have to deal. As shown in one of the discussions last week there has been an exchange of information between important companies that has helped to establish standards in cost and to promote legitimate rivalry in economies of production. In the effort to reform working hours at blast furnaces the Institute has helped in no small way in the abolition by the large steel companies of the 84-hour week. An important step in the enlargement of another branch of the Institute's work is the early taking over of the American Iron and Steel Association, which for so many years, under Mr. Swank's direction,

has done such splendid service in statistical and other lines.

No such organization has ever attempted to combine in its operations technical research and advancement, statistical work, and the handling of questions of market prices and supply and demand. So far as the mechanics and the metallurgy of iron and steel manufacture are concerned, the American Iron and Steel Institute is in better position than any other organization to build up a literature of modern practice. Its leaders have the final word in making available the results of the excellent work now under way on a score of important problems that are engaging their technical staffs. The outcome in this direction will therefore be watched with keen expectation.

Unless public sentiment changes, as it may under the educational process now going on, it is a question whether the cooperative movement among steel manufacturers will ever be resumed on just the lines followed previous to May, 1911. If it should turn out that such methods of preventing profitless selling can be carried on under legal sanction, it would seem that some machinery must be provided for representing the buyer in any effort to determine by conference what are "fair and reasonable" prices for iron and steel products. The idea of a Government commission with some sort of check on commodity prices has thus far found scant favor. On the other hand, there is no indication that public sentiment is any more favorable than heretofore to the unrestricted determination of price questions by organized producers.

Scrap and Open Hearth Steel

The flexibility of the basic open-hearth steel-making process is emphasized by the facility with which it uses scrap or does without it according to the exigencies of the market. The time was when it was thought scrap would become so scarce that the price would be forced to a much higher level, relative to pig iron, than formerly obtained, or else the growth of the basic open-hearth steel-making process would be impeded. Nothing of the sort has occurred. The adjustment has not been made in the market; it has been made by the steel works engineers. The manufacture of basic open-hearth steel has continued to grow, and the proportion of scrap consumed has decreased. So closely has the consumption of scrap been regulated to the supply that no marked change in the market price, relative to pig iron, has been discernible in a period in which the production of basic open-hearth steel has tripled.

In the main the adjustment has not been by the proportion of scrap used being varied from year to year at individual works. Rather the practice at one plant or another has changed, so that certain plants, formerly large consumers of scrap, have become small users. As to the proportion of scrap used by the industry as a whole, the index commonly consulted has been the proportion between the basic pig iron production as officially reported and the production of basic open-hearth steel ingots and castings. There is little basic iron used for purposes other than basic open-hearth steel making, and the output in ingots or castings of a given plant is substantially equal to the quantity of scrap and pig iron charged. The percentage of basic pig iron made to basic open-hearth steel ingots and castings made has been as follows from the first year

in which the production of basic pig iron was separately reported:

Basic Pig Iron to Basic Steel, Per Cent

1897	52.7	1905	52.5
1898	50.1	1906	52.0
1899	47.4	1907	52.4
1900	42.1	1908	57.1
1901	40.0	1909	61.5
1902	45.2	1910	59.5
1903	43.0	1911	58.0
1904	48.5		

Prior to 1904 the proportion of pig iron averaged below 45 per cent., indicating a scrap percentage of over 55 per cent. In the past five years, on the other hand, beginning with 1907, the proportion of pig iron has averaged above 55 per cent., indicating less than 45 per cent. of scrap.

The two chief causes which have operated to decrease the scrap supply, relative to the requirements, have been the increase in basic open-hearth steel production and the decadence of Bessemer steel production. The basic open-hearth steel production first ran into seven figures in 1897, with an output of 1,056,043 tons. Since then there have been but two years which did not break all previous records, these being 1908, the off year, and 1911. The 1910 production was 15,292,329 tons and the 1911 production 14,635,932 tons. From 1897 to 1910, 13 years, production was multiplied by about 15, the average rate of increase, one year over the preceding, being 22.8 per cent. The rule of doubling every decade in pig iron involves an annual output increment of only 7.2 per cent.

The other cause operating to decrease the scrap supply has been the decadence of the Bessemer process, which feeds the basic open-hearth furnace with much new material. The Bessemer steel production increased from 5,475,315 tons in 1897 to 12,275,830 tons in 1906, then declining to 7,947,849 tons in 1911.

Over the past eight years there has been, as intimated at the outset, no important change in the market price of scrap relative to the market price of basic pig iron. With the exception of one period, which will be referred to presently, the price of heavy melting steel scrap, delivered in the Pittsburgh district, has been from 25 to 50 cents above the price of basic pig iron, f.o.b. valley furnaces. In 1904 scrap averaged 35 cents above pig iron, using the quotations indicated. Last year, according to the average of our quotations from Pittsburgh, scrap was 7 cents below pig iron, but this year to date the average has been 15 cents above pig iron. The difference is negligible, comparing the present with 1904, but such difference as is shown is in the direction of scrap becoming cheaper relative to pig iron, which is contrary to the predictions of ten years ago.

The exception in the identity of scrap and pig iron market prices just mentioned is that which occurred in 1906-7-8, when scrap averaged from \$2 to \$5 below pig iron. The exception is one which tests the rule, for in those years pig iron was very high, reaching an average of \$21, valley, in 1907. Scrap could not follow it, for the pig iron influence is not simply what pig iron costs to buy; it is partly what it costs to make.

Undoubtedly the introduction of direct furnace metal has been the chief metallurgical influence in keeping down the price of scrap. At the outset both pig iron and scrap had to be melted, and then scrap dealers used the argument that heavy melting steel scrap was "worth" 15 per cent. more than pig iron. For years they waited until the day when scrap would come into its own by bringing, on account of scarcity,

what it was really worth. In later years scrap has had to compete, in substance, with molten pig iron, in which case of course the possible 15 per cent. advantage disappears.

The 40 to 45 per cent. pig iron to steel shown in the returns for 1900-1-2-3 probably represented the practice at the great majority of works. Few used much less or more than this proportion. With the 58 per cent. pig iron in 1911, and approximately 42 per cent. scrap, on the other hand, the case is altogether different. The 42 per cent. pig iron is an average struck between works which use much less pig iron and other works which use much more.

The editorial in *The Iron Age* of May 16 on "The Consolidations and Iron and Steel Prices" contained the sentence: "It is equally evident that in a modified way the sharp peaks [in the price chart] of 1899 would have been repeated in 1892 and in 1895, 1896 and 1897, but for the effort put forth to prevent a runaway market." As is evident from the context, the last four years referred to were 1902, 1905, 1906 and 1907.

Governor Foss Vetoes a Labor Bill

It is especially refreshing at this time, when political exigencies seem to make it desirable for all parties to cultivate the organized labor vote, that one man of great political prominence should have the courage to take a stand in favor of the preservation of order during labor troubles. Governor Foss of Massachusetts allowed no political influences to interfere with his duty to the commonwealth in maintaining order in the late disturbances at Lawrence, and now he emphasizes the position then taken by vetoing a bill to permit peaceful persuasion during strikes, lockouts or labor disturbances. In his message to the Legislature accompanying his veto he says:

"The right of free speech is already sacred in Massachusetts; and so equally is the right of every one to freedom from molestation. Both these rights are guaranteed by our fundamental law. This proposed law, if enacted, would break down the equitable balance of our present law; it would add nothing to the already established rights which every citizen possesses so long as he keeps the peace, and its effect would inevitably be to withdraw from our citizens their right to protection from molestation upon the public streets."

Heavy Bethlehem Castings and Forgings

Among several steel castings of unusual size now undergoing machining at the Bethlehem Steel Company's plant at South Bethlehem, Pa., is one that will become the cap of a 10,000-ton hydraulic press being manufactured for the Carnegie Steel Company's Schoen wheel plant at McKees Rocks, Pa. An idea of the magnitude of this press is given in the statement that the cap weighs 375,000 lb. and is only one of the several large steel castings and forgings in this contract, which require the use of the Bethlehem Steel Company's special car. The columns of the press are 32 in. in diameter, 37 ft. long, and are made of Bethlehem Steel Company fluid compressed gun steel, hollow forged, and of a special mixture to meet the severe service at the Carnegie Steel Company's Schoen plant. As far as the columns are concerned, this is the largest hydraulic press in the world. The cylinder is 72 in. in diameter, and is the largest copper lined cylinder in the world.

The two presses previously built by the Bethlehem Steel Company for similar service and designed by its engineer, Casimir von Philp, are of greater capacity but the parts are not of such enormous size. The press now under construction will be one of the fastest for its capacity, which is 60 car wheels per hour, the actual guarantee being somewhat less.

The National Association of Manufacturers

The opening session of the seventeenth annual convention of the National Association of Manufacturers was held Monday afternoon at the Waldorf-Astoria, New York, with more than 250 members in attendance. The meeting was called to order by John Kirby, Jr., president of the organization, who incisively discussed the present chaotic condition of political and industrial affairs, vigorously attacked those who are responsible for the feeling of unrest and unsparingly denounced labor agitators.

Following the appointment of new committees the reports of committees on rules and order, consular reform, bankruptcy, merchant marine, and union label were read. The union label report recommended to those who believe in the principles of the open shop that they return union label printing marked with appropriate comment "to the source from which it comes," and further it was urged that patronage be given those concerns which ignore the union label. The report on consular reform advocated the selection of "a staff trained in its duties, alive to the conditions, and business-like in its activities" for the proper development and extension of foreign trade.

Gen. Harrison Grey Otis of Los Angeles, Cal., and Mrs. Harriet Fisher Andrews of Trenton, N. J., addressed the convention on labor topics. William J. H. Boettger, secretary of the Citizens' Industrial Committee of Toledo, Ohio, reviewed the progress of industrial education, reciting some of his own experiences.

An interesting feature of the afternoon session was an exhibition by moving pictures of accident prevention in actual practice at the works of the Brown & Sharpe Mfg. Company, Providence, R. I.; an accident to a workman and the results upon himself and his family; safety appliances operated at sea; a factory fire drill in a New Jersey plant. In an adjoining room were shown more than 1400 photographs of safety appliances, loaned by the Industrial Commission of Wisconsin, models from the United States Steel Corporation, and other devices in the same line.

On Tuesday the convention passed resolutions advocating a permanent non-political tariff commission; indorsing national bankruptcy laws; welcoming the establishment of a national chamber of commerce; denouncing legislation seeking to exempt labor unions from the anti-trust act and urging uniform State laws. H. E. Miles, president of the Wisconsin State Board of Industrial Education, in a report said that the United States is far behind Germany in industrial schooling and that American common schools give an insufficient return for the millions it costs to run them each year. He made a plea for increased interest on the part of manufacturers for industrial education. Addresses were made on important matters pending in Congress affecting manufacturers. The convention continued in session on Wednesday, closing with a banquet Wednesday evening.

Belgium Steel Trade Agreement

An agreement is said to have been reached by all the Belgian steel works for the renewal of the so-called Comptoir des Aciéries Belges controlling the home and export sale of steel beams and channels above 3 in. manufactured in Belgium. The existing arrangements will expire July 1, and from that date for five years the Belgian syndicate will include the following firms: In the Liege district—Ougrée et Harihay Company at Ougrée, John Cockerill at Seraing, Aciéries d'Angleur at Tilleur, and S. A. Athus-Grivegnée at Grivegnée; in the Hainault Province—the Providence works, the Sambre et Moselle works, Usines Métallurgiques du Hainault, Thy le Chateau works, the firm Boel at La Louvière, and finally the Clabecq rolling mills at Clabecq, near Brussels.

Rolling Mill Wage Scales

The new scale as adopted at the thirty-seventh annual convention of the Amalgamated Association of Iron and Steel Workers, in session at Chicago last week, provides for an increase in the puddling scale of 25c. per ton, making the base price \$5.25, advancing 15c. per ton for every advance of \$1 per ton in the selling price of bar iron above the 1c. card rate, as provided for in the bi-monthly settlements. The present puddling scale, which

expires June 30, calls for an advance of 12½c. per ton for every advance of \$1 per ton in the selling price. The scales for busheling and finishing provide for practically the present rates, with some slight modifications in the foot notes.

The United Sons of Vulcan, in session at Youngstown, Ohio, last week, decided to discard the sliding wage scale for puddling and to adopt a flat scale based on \$6 per ton. It is expected that the bar iron makers who treat with this organization will refuse to sign the proposed scale, which calls for a material advance over the present rate.

The bi-monthly settlement of the puddling scale was made last week between the Amalgamated Association and the Western Bar Iron Association on a 1.15c. card, calling for \$5.37½ per ton for puddling for May and June, being the same rate that was in effect for March and April.

The Sykes Roofing Company Sold

The entire plant and good will of the Sykes Metal Lath & Roofing Company, Niles, Ohio, has been bought by Ira A. Thomas and Claude R. Thomas, of Youngstown. The purchasers are stockholders in the Brier Hill Steel Company, but so far as known the plant will not be turned over to that company. The Sykes Metal Lath & Roofing Company was founded in 1877 by R. G. Sykes, who for many years lived in Niles but now resides in Chicago. It is one of the pioneer roofing concerns, and at first was known as the Sykes Metal Roofing Company, but when the lath department was added in 1892 the name was changed. Frank L. Stewart, who has been manager for about 22 years, and has served as vice-president and treasurer since 1902, will retire. It is reported that the new owners will considerably enlarge the plant.

Lake Superior Charcoal Furnaces.—In a good piece of printing—a broad-paged pamphlet of 36 pages—the Lake Superior Iron & Chemical Company, Detroit, Mich., describes its blast furnaces and products. The effective method is followed by telling a story about each plant and the iron it produces, and the result has been to invest the charcoal iron industry of Wisconsin and Michigan with an interest it has not had in the years of its comparative backwardness in tonnage. In this latest bit of literature the company has given a good idea of the advance made at its various plants, the effort made to get the manufacture and use of charcoal iron on a more scientific basis, and the results obtained in better quality. There are views of the different furnaces and chemical plants and some account of each. The six blast furnaces can produce 200,000 tons of iron a year and the chemical plants 3,420,000 gallons of wood alcohol and 61,560,000 lb. of acetate of lime.

The Defiance Machine Works, Defiance, Ohio, is enlarging its plant. Two buildings are being erected, one to be used for erecting and the other for cleaning castings, shafting department, grinding and plate shop and blacksmith department. The first will be 77 x 132 ft. and the second 97 x 115 ft., both having saw-tooth roofs. The company will increase its capacity about 25 per cent. The motive power has been changed from steam to electricity. The power will be supplied by the city at about 1¼c per kilowatt, but the company will install apparatus for making its own current to be used in case of emergency.

The Wesco Supply Company, St. Louis, Mo., has made arrangements whereby it will act as distributor of the Hagstrom spark plug and other Hagstrom specialties in St. Louis the coming season. The Wesco Company has branch houses at Birmingham, Ala., and Fort Worth, Texas, and has 25 salesmen covering the entire South. This is a new departure on the part of the company, as heretofore it has been identified only with the electrical supply business.

The Japanese battle cruiser Kongo was launched May 18 by Vickers, Sons & Maxim, Barrow-in-Furness, England. This vessel displaces 27,500 tons and is stated to be the heaviest battle cruiser yet built. Three ships of the same size and type are being built in Japan. Each will carry eight 14-in. guns and 16 6-in. guns. Turbine engines are used, which are estimated to develop a speed of 28 knots.

The Iron and Metal Markets

Consumption Still Increasing

Deliveries Now a Chief Concern

Advances in Tin Plate, Boiler Tubes, Rivets and Bolts, Ferromanganese and Copper

The fact that new buying is at a slackened rate is of secondary interest to the steel trade; sooner than expected the question of making deliveries fast enough to satisfy buyers has become important. Running at nearly 95 per cent. of their steel making capacity and with orders that will last them for several months, the largest producers are well satisfied with their position. They do not ignore the fact that an unfavorable turn outside the industry has been known to bring cancellations, but there is as yet no sign in the present situation that the approach of greater political turmoil is affecting consumption. It has rather increased this month, and production in many lines is now at a greater rate than in April.

Price advances are made with less difficulty and the important ones which came in April are holding, apart from some concessions on structural material. A 5000-ton plate order is reported from the Central West at the full price of 1.25c., Pittsburgh. Tin plates were advanced 10c. a box in the past week, steel boiler tubes one point or about \$2 a ton, while in rivets a second advance was made within a week and one in bolts effective May 18. The advance in boiler tubes is taken to point to higher prices for merchant pipe, but these are not expected before July 1.

The purchases of semi-finished steel by the largest interest to relieve the very heavy pressure for open hearth steel have been larger than has yet been reported. One subsidiary has gone outside for 20,000 tons of sheet bars, and 10,000 tons of billets will be shipped from the East to Pittsburgh because of the congestion there.

Blast furnace operations reflect increased requirements of both steel making and merchant pig iron. Aliquippa furnace No. 4 and Clinton furnace have been blown in in the Pittsburgh district. The second Toledo furnace, long out of blast, has resumed, and the second new Iroquois stack in the Chicago district will soon be a producer. The Youngstown Sheet & Tube Company announces that it will build at once a fourth 500-ton stack. Pig iron stocks have been reduced, even with larger output.

Pig iron buying has fallen off because melters have quite generally provided for their wants through the third quarter and many of them farther. The buying movement of April and early May was evidently greater than the measure taken of it at the time. In eastern Pennsylvania, for example, one interest took about 35,000 tons of basic iron, most of it at slightly below \$15. In the past week 5000 tons of basic has sold at \$15.25 delivered in Eastern Pennsylvania.

In the Central West buying of Bessemer iron by the Steel Corporation is reported but not confirmed. A Pittsburgh steel company has bought basic for July at about \$13.25 at Valley furnace and on a 12,000-ton inquiry for basic iron \$13.50 has been quoted. An Eastern sale involved a round lot of low phosphorus and Bessemer irons.

Pipe companies in Virginia and on the Delaware River have been buyers to the extent of 20,000 tons. Machinery foundries are melting rather more iron than in the early months of the year.

The coke situation is easier since the anthracite settlement. The labor supply is gradually increasing,

and furnace companies are slow to contract at the prices asked. They offer \$2 for the second half, while sellers have been holding for \$2.35.

Railroad demand continues to bear out the view that accumulated needs are being met. The Harriman Lines have bought about 35,000 tons of rails for new construction, following 40,000 tons placed in April for maintenance. Of the last purchase 4200 tons of Mayari Bessemer rails was placed with the Pennsylvania Steel Company. The Illinois Central has bought 4000 cars, making a total of nearly 35,000 for May; or more than in three months preceding. Car inquiries still amount to fully 30,000, including several thousand for a New England system that is also in the market for 150 locomotives.

The amount of structural steel work let in May is remarkable in both Eastern and Western districts. With more than 100,000 tons placed thus far the month may make a new record. A 10,000-ton hospital building contract is coming up in Chicago and in New York the Biltmore hotel, 14,000 tons, is about to be let.

All the leading sheet mills are running to practically full capacity, and some are having difficulty in getting sheet bars. Prices show some variations, however. In tin plate the advance just made is in the face of light demand; the makers expect, however, that it will be fully established and possibly a higher level, when fall contracting comes up.

Instances are reported of the payment of \$1 to \$2 premiums to secure prompt deliveries, and Central Western and Chicago plate mills in particular are buried under accumulated orders.

European markets still contribute their weekly quota of advances. In Great Britain the coal supply is nearly normal, but pig-iron stocks are still being reduced. English makers of ferromanganese have made a further advance of \$2.50 to \$48.50, Baltimore.

Under good buying the New York copper market has advanced about 3/8c. in the week and now stands at 16 3/8c. for Lake and 16 1/8c. for electrolytic, with the situation still favoring the seller.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics.

At date, one week, one month and one year previous.

Pig Iron, Per Gross Ton:	May 22, 1912.	May 15, 1912.	Apr. 24, 1912.	May 24, 1911.
Foundry No. 2 standard, Philadelphia.....	\$15.25	\$15.25	\$15.00	\$15.50
Foundry No. 2, Valley furnace.....	13.25	13.25	13.25	13.75
Foundry No. 2, Southern, Cincinnati.....	14.25	14.25	13.75	13.75
Foundry No. 2, Birmingham, Ala.....	11.00	11.00	10.50	10.50
Foundry No. 2, at furnace, Chicago*.....	14.50	14.50	14.00	15.00
Basic, delivered, eastern Pa.....	15.00	15.00	15.00	14.50
Basic, Valley furnace.....	13.00	13.00	13.00	13.25
Bessemer, Pittsburgh.....	15.15	15.15	15.15	15.90
Malleable Bessemer, Chicago.....	14.50	14.50	14.00	15.00
Gray forge, Pittsburgh.....	13.90	13.90	13.65	14.15
Lake Superior charcoal, Chicago.....	15.75	15.75	15.75	17.00

Billets, etc., Per Gross Ton:	May 22, 1912.	May 15, 1912.	Apr. 24, 1912.	May 24, 1911.
Bessemer billets, Pittsburgh.....	21.00	21.00	20.00	23.00
Open hearth billets, Pittsburgh.....	20.50	20.50	20.00	23.00
Forging billets, Pittsburgh.....	27.00	27.00	27.00	28.00
Open hearth billets, Philadelphia.....	23.40	23.40	22.40	25.40
Wire rods, Pittsburgh.....	25.00	25.00	25.00	29.00

Old Material, Per Gross Ton:	May 22, 1912.	May 15, 1912.	Apr. 24, 1912.	May 24, 1911.
Iron rails, Chicago.....	16.00	16.00	16.00	14.50
Iron rails, Philadelphia.....	16.50	16.50	15.50	16.75
Car wheels, Chicago.....	14.00	14.00	13.50	12.75
Car wheels, Philadelphia.....	13.50	13.50	13.00	13.00
Heavy steel scrap, Pittsburgh.....	13.25	13.25	13.25	13.00
Heavy steel scrap, Chicago.....	11.75	11.75	11.75	10.25
Heavy steel scrap, Philadelphia.....	13.50	13.50	13.25	13.00

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Finished Iron and Steel.	May 22, May 15, Apr. 24, May 24,			
	1912.	1912.	1912.	1911.
Per Pound to Largest Buyers:	Cents.	Cents.	Cents.	Cents.
Bessemer rails, heavy, at mill..	1.25	1.25	1.25	1.25
Iron bars, Philadelphia.....	1.30	1.30	1.27½	1.27
Iron bars, Pittsburgh.....	1.25	1.25	1.25	1.30
Iron bars, Chicago.....	1.25	1.25	1.15	1.22
Steel bars, Pittsburgh.....	1.20	1.20	1.20	1.40
Steel bars, tidewater, New York..	1.36	1.36	1.36	1.56
Tank plates, Pittsburgh.....	1.25	1.25	1.25	1.40
Tank plates, tidewater, New York	1.36	1.36	1.41	1.56
Beams, Pittsburgh.....	1.25	1.25	1.25	1.40
Beams, tidewater, New York.....	1.36	1.36	1.36	1.56
Angles, Pittsburgh.....	1.25	1.25	1.25	1.40
Angles, tidewater, New York.....	1.36	1.36	1.36	1.56
Skelp, grooved steel, Pittsburgh..	1.15	1.15	1.12½	1.30
Skelp, sheared steel, Pittsburgh..	1.20	1.20	1.17½	1.35

Sheets, Nails and Wire.

Per Pound to Largest Buyers:	Cents.	Cents.	Cents.	Cents.
Sheets, black, No. 28, Pittsburgh	1.90	1.90	1.90	2.20
Wire nails, Pittsburgh.....	1.60	1.60	1.60	1.80
Cut nails, Pittsburgh.....	1.55	1.55	1.55	1.60
Fence wire, ann'led, 0 to 9, P'gh.	1.40	1.40	1.40	1.60
Barb wire, galv., Pittsburgh....	1.90	1.90	1.90	2.10

Coke, Connellsville.

Per Net Ton, at Oven:	Cents.	Cents.	Cents.	Cents.
Furnace coke, prompt shipment.	2.20	2.25	2.60	1.45
Furnace coke, future delivery...	2.35	2.25	2.25	1.75
Foundry coke, prompt shipment.	2.50	2.50	2.75	1.75
Foundry coke, future delivery...	2.40	2.40	2.65	2.00

Metals, Per Pound:

	Cents.	Cents.	Cents.	Cents.
Lake copper, New York.....	16.02½	16.25	16.00	12.37½
Electrolytic copper, New York..	16.37½	16.00	15.87½	12.12½
Spelter, St. Louis.....	6.70	6.70	6.85	5.20
Spelter, New York.....	6.85	6.85	7.00	5.50
Lead, St. Louis.....	4.07½	4.05	4.12½	4.22½
Lead, New York.....	4.20	4.20	4.20	4.37½
Tin, New York.....	45.50	46.12½	44.75	44.60
Antimony, Hallett, New York....	7.62½	7.62½	7.75	9.00
Tin plate, 100-lb. box, New York	\$3.04	\$3.54	\$3.54	\$3.94

Finished Iron and Steel f.o.b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Paul, 32c.; St. Louis, 22½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates; structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.25c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers, with extras:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated February 6, 1903, or equivalent, ¾ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per square ft., are considered ¾-in. plates. Plates over 72 in. wide must be ordered ¾ in. thick on edge, or not less than 11 lb. per square ft. to take base price. Plates over 72 in. wide ordered less than 11 lb. per square foot, down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in. on thinnest edge	.10
Gauges under 3-16 in. to and including No. 8.....	.15
Gauges under No. 8 to and including No. 9.....	.25
Gauges under No. 9 to and including No. 10.....	.30
Gauges under No. 10 to and including No. 12.....	.40
Sketches (including all straight taper plates) 3 ft. and over in length	.10
Complete circles, 3 ft. in diameter and over.....	.20
Boiler and flange steel.....	.10
"A. B. M. A." and ordinary firebox steel.....	.20
Still bottom steel.....	.30
Marine steel.....	.40
Locomotive firebox steel.....	.50
Widths over 100 in. up to 110 in., inclusive.....	.05
Widths over 110 in. up to 115 in., inclusive.....	.10
Widths over 115 in. up to 120 in., inclusive.....	.15
Widths over 120 in. up to 125 in., inclusive.....	.25
Widths over 125 in. up to 130 in., inclusive.....	.50
Widths over 130 in.....	1.00
Cutting to lengths or diameters under 3 ft. to 2 ft., inclusive	.25
Cutting to lengths or diameters under 2 ft. to 1 ft., inclusive	.50
Cutting to lengths or diameters under 1 ft.....	1.55
No charge for cutting rectangular plates to lengths 3 ft. and over.	

Wire Rods and Wire.—Bessemer, open hearth and chain rods, \$25. Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days, or 2 per cent. discount in 10 days, carload lots, to jobbers, annealed, \$1.40; galvanized, \$1.70. Carload lots to retailers, annealed, \$1.50; galvanized, \$1.80. Galvanized barb wire, to jobbers, \$1.90; painted, \$1.60. Wire nails, to jobbers, \$1.60.

The following table gives the prices to retail mer-

chants on wire in less than carloads, including the extras Nos. 10 to 16, which are added to the base price:

Fence Wire, per 100 Lb.								
Nos.	0 to 9	10	11	12 & 12½	13	14	15	16
Annealed	\$1.55	\$1.60	\$1.65	\$1.70	\$1.80	\$1.90	\$2.00	\$2.10
Galvanized	1.85	1.90	1.95	2.00	2.10	2.20	2.60	2.70

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in., and angles, 3 to 6 in., on one or both legs, ¼ in. and over, 1.25c. Other shapes and sizes are quoted as follows:

	Cents per lb.
I-beams over 15 in.....	1.30 to 1.35
H-beams over 18 in.....	1.30 to 1.35
Angles over 6 in.....	1.30 to 1.35
Angles, 3 in. on one or both legs, less than ¼ in. thick, plus full extras, as per steel bar card Sept. 1, 1909.....	1.30 to 1.35
Tees, 3 in. and up.....	1.30 to 1.35
Zees, 3 in. and up.....	1.25 to 1.30
Angles, channels and tees, under 3 in., plus full extras as per steel bar card Sept. 1, 1909.....	1.30 to 1.35
Deck beams and bulb angles.....	1.55 to 1.60
Hand rail tees.....	2.10 to 2.25
Checkered, trough and corrugated floor plates.....	2.25 to 2.50

Extras for Cutting to Length.

	Cents per lb.
Under 3 ft., to 2 ft., inclusive.....	.25
Under 2 ft., to 1 ft., inclusive.....	.50
Under 1 ft.....	1.55
No charge for cutting to lengths 3 ft. and over.	

Sheets.—Makers' prices for mill shipments on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows:

Blue Annealed Sheets.

Nos. 3 to 8.....	1.25 to 1.30
Nos. 9 and 10.....	1.35 to 1.40
Nos. 11 and 12.....	1.40 to 1.45
Nos. 13 and 14.....	1.45 to 1.50
Nos. 15 and 16.....	1.55 to 1.60

Box Annealed Sheets, Cold Rolled.

Nos. 10 to 12.....	1.55 to 1.60
Nos. 13 and 14.....	1.60 to 1.65
Nos. 15 and 16.....	1.65 to 1.70
Nos. 17 to 21.....	1.70 to 1.75
Nos. 22, 23 and 24.....	1.75 to 1.80
Nos. 25 and 26.....	1.80 to 1.85
No. 27.....	1.85 to 1.90
No. 28.....	1.90 to 1.95
No. 29.....	1.95 to 2.00
No. 30.....	2.05 to 2.10

Galvanized Sheets of Black Sheet Gauge.

Nos. 10 and 11.....	1.90 to 2.00
Nos. 12, 13 and 14.....	2.00 to 2.10
Nos. 15 and 16.....	2.10 to 2.15
Nos. 17 to 21.....	2.30 to 2.40
Nos. 22, 23 and 24.....	2.40 to 2.50
Nos. 25 and 26.....	2.60 to 2.70
No. 27.....	2.75 to 2.85
No. 28.....	2.90 to 3.00
No. 29.....	3.00 to 3.10
No. 30.....	3.20 to 3.30

All above rates on sheets are f.o.b. Pittsburgh, terms 30 days net, or 2 per cent. cash discount in 10 days from date of invoice, as also are the following:

Corrugated Roofing Sheets by Weight.

Effective April 18, 1912, the rates for painted and formed roofing sheets, per 100 lb., as announced by the American Sheet & Tin Plate Company, are based on the following extras for painting and forming over prices for corresponding gauges in black and galvanized sheets:

	Gauges, per 100 lb.			
	29	25 to 28	19 to 24	12 to 18
Painting.				
Regular or oiling.....	.05	.15	.10	.05
Graphite, regular.....	.05	.25	.15	.10
Forming.				
2, 2½, 3 and 5 in. corrugated	0.05	0.05	0.05	0.05
2 V-crimped, without sticks..	0.05	0.05	0.05	...
¾ to 1¼ in. corrugated.....	0.10	0.10	0.10	...
3 V-crimped, without sticks..	0.10	0.10	0.10	...
Pressed standing seam, with cleats.....	0.15	0.15	...	...
Plain roll roofing, with or without cleats.....	0.15	0.15	0.15	...
Plain brick siding.....	0.20	0.20	...	...
3/15 in. crimped.....	0.20	0.20	0.20	...
Weatherboard siding.....	0.25	0.25	...	...
Beaded ceiling.....	0.25	0.25	...	...
Rock face brick and stone siding.....	0.25	...	...	...
Roll and cap roofing, with caps and cleats.....	0.25	0.25	...	...
Roofing valley, 12 in. and wider.....	0.25	0.25	...	...
Ridge roll and flashing (plain or corrugated).....	0.65	0.65	0.65	...

Corrugated Roofing Sheets, with 2½-In. Corrugations, Per Square.

Some leading manufacturers of roofing material are still quoting on an area basis and are naming prices as follows:

Gauge.	Painted.	Galvanized.	Gauge.	Painted.	Galvanized.
29.....		\$2.40	23.....	\$2.30	\$3.50
28.....	\$1.35	2.55	22.....	2.50	3.80
27.....	1.50	2.60	21.....	2.70	4.05
26.....	1.60	2.65	20.....	2.90	4.35
25.....	1.80	3.05	18.....	2.90	5.70
24.....	2.00	3.15	16.....	4.70	6.50

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on wrought pipe, in effect from December 1, 1911; galvanized iron pipe, from March 1, 1912:

Butt Weld.		Steel		Iron	
		Black.	Galv.	Black.	Galv.
1/8 and 1/4 in.....		74	54	68	49
3/8 in.....		75	65	69	53
1/2 in.....		78	68	72	59
3/4 to 1 1/2 in.....		81	72	75	64
2 to 3 in.....		82	75	76	65
Lap Weld.					
1 1/4 and 1 1/2 in.....				68	61
2 in.....		79	72	72	63
2 1/2 to 4 in.....		81	74	74	66
4 1/2 to 6 in.....		80	72	73	65
7 to 12 in.....		78	68	71	61
13 to 15 in.....		55		47	
Butt Weld, extra strong, plain ends, card weight.					
1/4, 1/4, 3/8 in.....		70	60	65	55
1/2 in.....		75	69	70	63
3/4 to 1 1/2 in.....		79	73	74	65
2 to 3 in.....		80	74	75	66
Lap Weld, extra strong, plain ends, card weight.					
1 1/2 in.....				66	60
2 in.....		76	70	71	63
2 1/2 to 4 in.....		78	72	73	66
4 1/2 to 6 in.....		77	71	72	65
7 to 8 in.....		70	60	65	55
9 to 12 in.....		65	55	60	50
Butt Weld, double extra strong, plain ends, card weight.					
1/2 in.....		65	59	60	52
3/4 to 1 1/2 in.....		68	62	63	55
2 to 3 in.....		70	64	65	57
Lap Weld, double extra strong, plain ends, card weight.					
2 in.....		66	60	61	52
2 1/2 to 4 in.....		68	62	63	57
4 1/2 to 6 in.....		67	61	62	56
7 to 8 in.....		60	50	55	45

Plugged and Reamed.

1 to 1 1/2, 2 to 3 in. Butt Weld	points lower basing (higher price) than merchants' or card weight pipe. Butt or lap weld as specified.
2, 2 1/2 to 4 in. Lap Weld	

The above discounts are for "card weight," subject to the usual variation of 5 per cent. Prices for less than carloads are three (3) points lower basing (higher price) than the above discounts.

Boiler Tubes.—Discounts on lap welded steel and standard charcoal iron boiler tubes to jobbers in carloads are as follows:

		Standard Charcoal Iron.
1 1/4 to 2 1/4 in.....	64	1 1/2 in.....48
2 1/2 in.....	66 1/2	1 3/4 to 2 1/2 in.....50
2 3/4 to 3 1/4 in.....	71 1/2	2 1/2 in.....55
3 1/2 to 4 in.....	74	2 3/4 to 5 in.....60
4 1/2 to 6 in.....	66 1/2	
5 to 6 in.....	66 1/2	
7 to 13 in.....	64	

2 1/2 in. and smaller, over 18 ft., 10 per cent. net extra.

2 1/4 in. and larger, over 22 ft., 10 per cent. net extra. Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft. and all shipments going west of the Mississippi River must be sold f. o. b. mill at Pittsburgh basing discount, lowered by two points.

Pittsburgh

PITTSBURGH, PA., May 22, 1912.—(By Telephone.)

Pig Iron.—The local pig iron market is quiet as regards new inquiries, but the furnaces are rapidly cleaning up stocks and prices are very firm. On an inquiry from an open-hearth steel plant for 12,000 tons of basic iron for the last half of the year, the lowest price quoted is \$13.50 at Valley furnace. Reports that the Steel Corporation has bought 25,000 tons of iron from a local concern have not been verified. Present consumption of pig iron is believed to be fully as large as the output and higher prices for the last half of the year are predicted. The Pittsburgh Steel Company is said to have bought a large tonnage of basic iron for July delivery at close to \$13.25 at furnace. We quote standard Bessemer iron at \$14.25 to \$14.50; basic, \$13 to \$13.25; malleable Bessemer, \$13 to \$13.25; No. 2 foundry, prompt delivery, \$13.25, and for last half, \$13.50; gray forge, \$13, all at Valley furnace, the freight rate to the Pittsburgh district being 90c. a ton.

Steel Billets and Sheet Bars.—As showing the great scarcity of steel we can state that the American Sheet & Tin Plate Company has recently bought upward of 20,000 tons of billets and sheet bars in the open market, not being able to get steel fast enough from the Carnegie

Steel Company to take care of its own commitments. Neither of the local steel interests is selling steel in the open market, and as the smaller steel concerns are well sold out, the available supply of billets and sheet bars is very limited and is bringing full prices. We quote open-hearth billets \$20.50 to \$21; Bessemer billets, \$21 to \$21.50; Bessemer and open-hearth sheet bars, \$21.50 to \$22; axle billets, \$25; forging billets, for general forging purposes, \$28, all f.o.b. Pittsburgh, and f.o.b. Youngstown, Bessemer and open-hearth billets, \$21; Bessemer and open-hearth sheet bars, \$22.

(By Mail)

All reports from the iron and steel trades are of the most encouraging nature. Indications are that the heavy volume of business now being received by the mills will be maintained the next three or four months at least. In hot-rolled products, such as steel bars, shapes, plates, tin plate and sheets, the mills are getting further behind in deliveries, some not being able to promise shipments on new contracts two months or more from date of order. Two of the leading local plate makers are not promising deliveries inside of eight weeks. The leading events of the week are advances in prices of 10 cents per box in tin plate, one point in boiler tubes, a second advance within a week on rivets and another advance on bolts. The advance in boiler tubes indicates that the mills are well sold up, and is regarded as a forerunner of an advance in prices of merchant pipe. The coke market is also active, some large contracts for last half delivery having been closed. The scrap market is strong; a good deal of material is changing hands. Some grades of scrap have advanced. From every point of view the situation looks good and predictions are freely made that prices will be higher all along the line in the very near future. The steel and allied trades are suffering from a serious shortage in labor, which is being particularly felt in the coke regions, keeping down to some extent the output of coke.

Ferroalloys.—The new price of \$48.50, Baltimore, on 80 per cent. English ferromanganese seems to be firmly established, and a local interest report sales of 300 to 400 tons for last half delivery at that price. Several large inquiries for last half are in the market. Ferromanganese for prompt shipment can hardly be obtained at any price. Sales of several carloads are reported at \$54 to \$55, Baltimore, and small consumers have paid higher prices for a few tons to tide them over until a regular supply can be obtained. Prices on ferro-silicon are also very strong and sales of carloads and up to 100 tons are being made at full prices. We note two cars, or about 60 tons, sold at \$70. An advance on the lower grades is looked for in the near future. We quote 50 per cent. in lots up to 100 tons, at \$70; over 100 tons to 600 tons, \$69, and over 600 tons, \$68, Pittsburgh. The lower grades are ruling at about \$20 for 10 per cent.; \$21 for 11 per cent.; \$22 for 12 per cent., f.o.b. cars at furnace, Ashland, Ky., or Jackson, Ohio. The demand for ferrotitanium is active, and we quote 8c. per lb. for carload lots; 10c. per lb. in 2000-lb. lots and over, and 12 1/2c. per lb. in lots up to 2000 lb.

Wire Rods.—There is not much new buying of wire rods, but the market is strong. A number of contracts expire June 30 and a good many consumers are expected to make new contracts shortly for their supply for last half of the year. One leading maker is reported holding rods at \$26. We continue to quote Bessemer, open hearth and chain rods at \$25 to \$26, Pittsburgh, the lower price being minimum of the market on large lots.

Muck Bar.—There are practically no muck bars in the local market, consumers making their own. The puddling plant of the Kittanning Steel & Iron Company has been idle for some time. We quote best grades of all pig iron muck bar at about \$29, Pittsburgh.

Skelp.—The new demand for both iron and steel skelp is more active, and prices are very firm. The call for iron skelp is particularly heavy, and sales of about 3000 tons of grooved iron are reported at about 1.55c., Pittsburgh. We quote grooved steel skelp at 1.15c. to 1.17 1/2c.; sheared steel skelp, 1.20c. to 1.22 1/2c.; grooved iron skelp, 1.55c. to 1.60c.; sheared iron skelp, 1.65c. to 1.70c., delivered at buyer's mill, Pittsburgh district.

Steel Rails.—No important orders for standard sections have recently been placed with the local interest, but specifications against contracts are coming in freely. The Ohio works of the Carnegie Steel Company at Youngstown is on sheet bars this week, but will go on open hearth rails next week. The demand for light rails is fairly active; the Carnegie Company received new orders and specifications the past week for about

3000 tons. Three Edgar Thomson rail mills at Bessemer are running at present to nearly full capacity, No. 1 mill being on standard sections, No. 2 on sheet bars and No. 3 on light rails. We quote splice bars at 1.50c. per lb. and rails as follows: Standard sections, 1.25c. per lb.; 8 and 10-lb. light rails, 1.29½c.; 12 and 14-lb. 1.20c.; 16 and 20-lb., 1.15c.; 25, 30, 35, 40 and 45-lb., 1.10c., in carload lots, f.o.b., Pittsburgh.

Structural Material.—New inquiries have been more active and a good deal of tonnage has been placed. The McClintic-Marshall Construction Company has taken 250 tons for new buildings for the Stanley Works at Niles, Ohio, and about 300 tons for a new building for the American Cyanide Works at Niagara Falls, N. Y. The Pennsylvania Steel Company has taken 2000 to 2500 tons for a new steel bridge for the Pennsylvania Railroad crossing the Monongahela River at Brownsville, Pa. The Ritter-Conley Mfg. Company is low bidder on about 4000 tons of steel for new buildings for the open hearth steel plant of the Pittsburgh Steel Company at Monessen, Pa. The Fort Pitt Bridge Works has taken about 1000 tons of bridge work for the Northern Pacific and about 2000 tons for the Great Northern. The American Bridge Company has taken 2200 tons for a steel building in the West and about 1400 tons of bridge work for a Western railroad. The fabricators are quoting slightly higher prices and in some cases obtaining them. The market is very strong and we quote beams and channels up to 15 in. at 1.25c., Pittsburgh.

Plates.—The only active car inquiry is that of the New York Central for about 2000 steel underframe cars. The Great Northern has placed a contract for 500 automobile cars and 1000 wooden ore cars with the Haskell & Barker Company, and the Wabash has ordered 500 steel underframe box cars from the same concern, the plates and shapes to be furnished by the Illinois Steel Company. The Alabama, Tennessee & Northern Railroad has ordered 250 cars from the American Car & Foundry Company. The plate mills are filled with work for the next two or three months and are steadily getting further behind in deliveries. The Carnegie Steel Company is practically filled for the next four months. A Youngstown plate mill is credited with having taken a contract for 5000 tons for delivery over the next two months at the full price of 1.25c., Pittsburgh. The new demand for freight cars has quieted down in the past week or two, but this will give the mills some chance to catch up on deliveries. The market is firm and we quote sheared plates, ¼ in. and heavier, at 1.25c., Pittsburgh.

Sheets.—New demand and specifications against contracts continue very heavy and all the mills are behind in deliveries ranging from four to eight weeks or longer. The American Sheet & Tin Plate Company is operating its sheet mills to about 92 per cent. of capacity, and its shipments of sheets this month will probably be as heavy as in April, which was a record month. Other mills are being operated to practically full capacity and some are having trouble in getting a supply of bars as fast as needed. The market is firm, No. 28 black sheets being held at 1.90c. to 1.95c., and galvanized sheets from 2.90c. to 3c., Pittsburgh, the lower prices being absolutely minimum.

Tin Plate.—Under date of May 16 the American Sheet & Tin Plate Company sent out notices of an advance of 10c. per box to \$3.50 per base box of 14 x 20 coke plates. The main reason for this advance is the high price ruling for pig tin. New demand for tin plate is fair, but specifications against contracts are very heavy and all the mills are more or less behind in shipments. The American Sheet & Tin Plate Company is operating its tin plate mills very close to 95 per cent. of capacity, turning a much larger output than ever before in its history. It is now booking orders from jobbers at the new price of \$3.50 for delivery through third quarter and from large consumers for delivery up to the close of the year. We quote tin plate at \$3.40 to \$3.50 base for 14 x 20 coke plates.

Iron and Steel Bars.—Consumers of steel bars report that they are having much trouble in getting deliveries from the mills as fast as needed, and it is evident that some makers are badly oversold. The new demand for steel bars continues quite heavy, while specifications against contracts are being received by the mills at an unprecedented rate. The new demand for iron bars is fairly large and specifications against contracts are heavier than for some time. We quote steel bars at 1.20c. and common iron bars at 1.25c. to 1.30c. Pittsburgh.

Hoops and Bands.—The new demand is only fairly active, but specifications against contracts are very heavy and in some cases makers are getting behind in

shipments. We quote steel bands at 1.20c., with extras as per the steel bar card, and steel hoops at 1.25c. to 1.30c., the lower price being absolutely minimum.

Bolts and Rivets.—The new demand and specifications against contracts are heavier than for some time, some makers reporting they are considerably behind in deliveries. Prices are firm. We quote structural rivets at \$1.50 to \$1.55 per 100 lb. base, and boiler rivets at \$1.60 to \$1.65 per 100 lb. base, in carload lots, f.o.b. cars, Pittsburgh. On May 18 another advance was made in prices of bolts and we now quote as follows: Small carriage bolts, cut thread, 80 and 7½ per cent. off; small carriage bolts, rolled threads, 80 and 15 off; large carriage bolts, 75 and 10 off; small machine bolts, rolled threads, 80 and 20 off; small machine nuts, cut threads, 80 and 12½ off; large machine bolts, 75 and 15 off; square hot-pressed nuts, blank or tapped, \$6.30 off, and hexagon nuts, \$7.10 off. These prices are in lots of 300 lb. or over delivered within a 20c. freight radius of maker's works.

Shafting.—The new demand is only fair and specifications against contracts are being received in only moderate volume. Prices are firm, but are unchanged. We quote cold-rolled shafting at 67 per cent. off in carloads and 62 per cent. in less than carloads delivered in base territory.

Spelter.—The demand has been more active and prices have shown a slight advance. We quote prime grades of Western at 6.82½c. Pittsburgh.

Railroad Spikes.—Some time ago the Baltimore & Ohio Railroad placed a contract with a local maker for about 10,000 kegs and has recently specified freely. Liberal specifications against contracts are also coming in from some of the Western roads. Prices are about 5c. higher. We quote base sizes at \$1.45 per 100 lb. f.o.b., Pittsburgh.

Wire Products.—The new demand for wire nails is only fair and is mostly in small lots to cover actual needs of consumers. Makers also report that specifications against contracts are not coming in quite as freely as two or three weeks ago. It appears that the wire and wire nail trades have settled down for a quiet period until fall trade opens, which will be about August. Some makers of wire and wire nails recently cancelled contracts at \$1.50 basis, against which consumers had failed to specify, so that nearly all the wire nails now going out from the mills are on the \$1.55 basis. Only a comparatively small amount of new business has been placed with the mills at the \$1.60 rate for wire nails. We quote wire nails at \$1.60; cut nails, \$1.50; galvanized barb wire, \$1.90; painted, \$1.60; annealed fence wire, \$1.40, and galvanized fence wire, \$1.70, f.o.b. Pittsburgh, usual terms, freight added to point of delivery.

Merchant Pipe.—The new demand and specifications against contracts for merchant pipe continue heavy and actual mill bookings this month have been in excess of the same period in April. The tone of the market is stronger, and the advance just announced of one point in boiler tubes is taken by some in the trade to mean that an early advance in prices of merchant pipe is very probable. The Ohio Fuel Supply Company of this city is in the market for about 40 miles of 12-in. pipe and about 20 miles of 8 and 10-in. All the leading mills have a large amount of business on their books and in some cases are slightly behind in deliveries. It is stated that regular discounts on iron and steel pipe are being well maintained, but in the case of line pipe some mills are still naming low figures.

Boiler Tubes.—Effective May 21, the National Tube Company announced an advance of one point in discounts on steel boiler tubes which advances 3½ to 4 in. tubes to 74 per cent. off list. The new demand for boiler tubes and also for merchant tubes is heavier now than for some time.

Iron and Steel Scrap.—The scrap trade continues fairly active, but a good deal more material would be bought by consumers were it not for the fact that dealers are reluctant to sell in large lots, fearing that they might not be able to cover at satisfactory prices. Sales of heavy steel scrap have been quite large. We note transactions aggregating 6000 to 7000 tons at \$13.25 per gross ton delivered at consumer's mill in the Pittsburgh, Youngstown and Sharon district. There have also been some very large sales of old car wheels, on which prices are higher. Bundled sheet scrap is scarce and in good demand, with prices firm. There is also a large demand for borings and turnings, the available supply of which is limited, and prices are strong. We have advanced prices on old car wheels. Dealers are quoting as fol-

lows, per gross ton, f.o.b. Pittsburgh, unless otherwise noted:

Heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen and Pittsburgh delivery	\$13.25
No. 1 foundry cast	\$12.75 to 13.00
No. 2 foundry cast	10.75 to 11.00
Bundled sheet scrap f.o.b. consumers' mill, Pittsburgh district	11.25 to 11.50
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	13.75 to 14.00
No. 1 railroad malleable stock	11.75 to 12.00
Grate bars	9.50 to 9.75
Low phosphorus melting stock	15.00
Iron car axles	21.00 to 21.50
Steel car axles	15.75 to 16.00
Locomotive axles	22.00 to 22.50
No. 1 busheling scrap	12.00 to 12.25
No. 2 busheling scrap	8.00 to 8.25
Old car wheels	14.00 to 14.25
*Cast iron borings	9.75 to 10.00
*Machine shop turnings	10.00 to 10.25
†Sheet bar crop ends	14.00 to 14.25
Old iron rails	14.50 to 14.75
No. 1 wrought scrap	13.00 to 13.25
Heavy steel axle turnings	10.25 to 10.50
Stove plate	9.50 to 9.75

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.

†Shipping point.

Coke.—The coke market is quite active, with a strong demand for furnace coke for last half shipment. There is a serious shortage in the supply of labor in the coke regions, and this is keeping down the output to some extent. Some large contracts for furnace coke have been closed: One for 6000 tons a month for last half at \$2.40; one for 10,000 tons a month at \$2.35 for same delivery; one for 12,000 tons a month, also for same delivery, at \$2.50, and another for 8000 to 10,000 tons a month for last half at \$2.30, all per net ton at oven. In the case of two of these contracts it is stated that some special conditions were attached. Prompt furnace coke is slightly weaker, and is being offered at \$2.10 per net ton at oven. We note sales of 8000 to 10,000 tons of standard grade furnace coke for prompt shipment at prices ranging from \$2.10 to \$2.25 at oven. The new demand for foundry coke is fairly active, and 72-hr. standard grades are held at \$2.75 up to \$3 per net ton at oven. The output of coke in the upper and lower Connellsville regions, in the past week was 401,960 tons, being only a slight increase over the previous week.

Chicago

CHICAGO, ILL., May 20, 1912.

Under the impetus of the continued heavy specifying against plate, structural and bar contracts to meet railroad requirements, the mill situation is rapidly assuming a condition which has not existed for the past six years. It is still possible to obtain from two or three Eastern mills partial deliveries on orders within two weeks, but the local mill schedules do not admit of deliveries on plates, shapes, steel bars or sheets inside of six or eight weeks. Production thus far in May has been exceedingly heavy, and already April records have been surpassed. In addition to the heavy specifications there remain a number of inquiries for railroad material still unplaced. The market situation in many respects seems to forecast higher prices, and in some instances where mills are able to offer prompt delivery prices at \$1 a ton above the market are obtained. The condition of the mills as regards deliveries leaves little opportunity for sales inducements, based on the probabilities of advance in prices and little is heard regarding such a move.

Pig Iron.—The buying of pig iron has quieted very generally and the volume of inquiry for both Northern and Southern iron is limited. The market retains, however, a distinctly firm attitude as to price and the furnaces seem strongly fortified in their position on the strength of iron already sold, regardless of the present light inquiry. At Milwaukee the general quotation is understood to be \$15 at the furnace, which is 50c. above the furnace price at Chicago. The price for Southern iron continues on the basis of \$11, Birmingham, for No. 2 for last half delivery and \$11.50 for last quarter. Local stocks of iron have been greatly reduced and local furnacemen state that the blowing in of additional capacity is warranted to a greater extent at present than for a long period in the past. It is expected that the second new Iroquois furnace will blow in as soon as possible. The inquiry of the American Steel Foundries for basic iron for St. Louis delivery, though unplaced at this writing, is expected to be closed shortly. Other inquiry for basic also is reported. We quote for Chicago delivery, except for

local irons, which are f.o.b. furnace, the following prices on prompt shipments:

Lake Superior charcoal	\$15.75 to \$16.50
Northern coke foundry, No. 1	15.00
Northern coke foundry, No. 2	14.50
Northern coke foundry, No. 3	14.25
Northern Scotch, No. 1	16.00
Southern coke, No. 1 foundry and No. 1 soft	15.85
Southern coke, No. 2 foundry and No. 2 soft	15.35
Southern coke, No. 3	15.10
Southern coke, No. 4	14.35
Southern gray forge	13.85
Southern mottled	13.85
Malleable Bessemer	14.50
Standard Bessemer	16.75
Basic	14.75
Jackson County and Kentucky silvery, 6 per cent.	16.90
Jackson County and Kentucky silvery, 8 per cent.	17.90
Jackson County and Kentucky silvery, 10 per cent.	18.90

Rails and Track Supplies.—It is estimated that nearly 250,000 tons of rails have been purchased since May 1, of which a considerable proportion will be rolled by the local mills. Railroads are also ordering liberally of track supplies. The demand for light rails is fluctuating and uncertain. We quote standard railroad spikes at 1.55c. to 1.65c., base; track bolts with square nuts, 1.95c., base, all in carload lots, Chicago; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.20c. to 1.25c.; 16 to 20 lb., 1.25c. to 1.30c.; 12 lb., 1.30c. to 1.35c.; 8 lb., 1.35c. to 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—The Great Northern Railway Company has placed an order for a 2200-ton bridge with the Fort Pitt Bridge Works, and the Northern Pacific has awarded to the same interest a bridge of 1000 tons. The Vierling Steel Company, Chicago, will furnish 429 tons for the Y. M. C. A. building, Chicago. The Indiana Bridge Company will fabricate 344 tons for the Western Clock Company's building at La Salle, Ill., and the Joliet Bridge & Iron Company 102 tons for two highway spans in San Luis Obispo County, California. The Chicago Great Western Railroad is inquiring for bridge tonnage variously estimated from 1000 to 10,000 tons, more probably the former. It is expected that figures will be asked shortly for about 10,000 tons of steel for a new Cook County hospital, and for an addition to the Boyce Building, Chicago, 2000 tons will be required. Specifications for car building structural material continue extraordinarily heavy and there remain various inquiries such as that of the Illinois Central for 2500 freight cars and the proposed purchase for the Pennsylvania Lines West still unplaced. It is difficult to obtain deliveries of shapes from local mills before August 1. Local fabricators, the placing of whose orders have been delayed, are now finding trouble in obtaining the deliveries demanded by their building contracts. We quote for Chicago delivery, mill shipment on plain shapes, 1.43c., and from store, 1.70c.

Plates.—It is continually more apparent that the mill situation in its present crowded condition is entirely due to the great railroad buying. Purchases of boiler and tank plate are scarcely in normal volume and it is characteristic of the entire situation that the general manufacturer would be glad to see his business considerably increased. Prices are unchanged and we quote for Chicago delivery, mill shipment, 1.43c., and from store, 1.70c.

Bars.—The quantity of bar iron tonnage placed with the mills has increased so rapidly as to set deliveries back some three or four weeks. Local mills, however, seem to have been much more favored in the receipt of orders than the rolling mills of the surrounding territory. Prices are firmly on the basis of 1.25c., Chicago. Some of the makers of steel bars are attempting to avoid additional business, both because of the present crowded condition of their mills and in the belief that prices higher than 1.20c., Pittsburgh, will prevail. We quote as follows: Bar iron, 1.25c.; hard steel bars, 1.20c. to 1.25c.; soft steel bars, 1.38c., and from store, soft steel bars, 1.60c., Chicago.

Sheets.—A continued inflow of specifications has left little opportunity for bettering the mill situation in the matter of deliveries. Sheets for car roofing purposes in particular are heavily in demand. We quote Chicago delivery as follows: Carload lots, from mill, No. 28 black sheets, 2.08c. to 2.13c.; No. 28 galvanized, 3.13c. to 3.18c.; No. 10 blue annealed, 1.58c. to 1.63c. Prices from store are: No. 10, 1.95c.; No. 12, 2c.; No. 28 black, 2.30c., and No. 28 galvanized, 3.45c.

Rivets and Bolts.—Car builders are buying heavily of rivets but the amount of structural work in progress has limited somewhat the demands of that branch of the trade. While there is still some contracting on the part of carriage and implement makers for bolts and screws, this season is not bringing out heavy specifica-

tions. We quote as follows: Carriage bolts up to $\frac{3}{8}$ in. x 6 in., rolled thread, 80 and 15; cut thread, 80 and 10; larger sizes, 75 and 10; machine bolts up to $\frac{3}{8}$ in. x 4 in., rolled thread, 80 and 20; cut thread, 80 and 15; larger sizes, 75 and 15; coach screws, 80 and 20; hot pressed nuts, square head, \$6.40 off per cwt.; hexagon, \$7.30 off per cwt. Structural rivets, $\frac{1}{2}$ in. and larger, 1.68c. base, Chicago, in carload lots; boiler rivets, 0.10c. additional.

Old Material.—Despite the difficulty which melters are experiencing in the handling of incoming shipments, their requirements keep them in the market with undiminished activity. As a result the local scrap market continues to show a number of advances in price. An exception to this general trend is the weakness of cast scrap for which there seems to be little demand although purchases of stove plate continue in normal volume. From the fact that country scrap ordinarily going direct to outside rolling mills is now coming into this market, and with shipments from Chicago to these mills very light, it would seem that the melting demand is heaviest in the immediate environs of the city. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

Per Gross Ton.

Old iron rails.....	\$16.00 to \$16.50
Old steel rails, rerolling.....	13.25 to 13.75
Old steel rails, less than 3 ft.....	12.25 to 12.75
Relaying rails, standard section, subject to inspection.....	24.00
Old car wheels.....	14.00 to 14.50
Heavy melting steel scrap.....	11.75 to 12.25
Frogs, switches and guards, cut apart.....	11.75 to 12.25
Shoveling steel.....	11.75 to 12.25
Steel axle turnings.....	9.50 to 10.00

Per Net Ton.

Iron angles and splice bars.....	\$13.75 to \$14.25
Iron arch bars and transoms.....	15.25 to 15.75
Steel angle bars.....	11.75 to 12.25
Iron car axles.....	19.25 to 19.75
Steel car axles.....	15.75 to 16.25
No. 1 railroad wrought.....	12.50 to 13.00
No. 2 railroad wrought.....	11.50 to 12.00
Steel knuckles and couplers.....	11.00 to 11.50
Steel springs.....	11.25 to 11.75
Locomotive tires, smooth.....	13.00 to 13.50
Machine shop turnings.....	7.50 to 8.00
Cast and mixed borings.....	6.75 to 7.00
No. 1 busheling.....	10.25 to 10.75
No. 2 busheling.....	7.75 to 8.00
No. 1 boilers, cut to sheets and rings.....	8.50 to 9.00
Boiler punchings.....	13.00 to 13.50
No. 1 cast scrap.....	12.00 to 12.50
Stove plate and light cast scrap.....	10.25 to 10.75
Railroad malleable.....	11.50 to 12.00
Agricultural malleable.....	10.50 to 11.00
Pipes and flues.....	9.25 to 9.75

Wire Products.—Although the movement of wire products from mills has shown practically no falling off from the record production of April, there is a slight lull in retail buying in the rural districts owing to the demand upon the farmers for plowing and planting. This is particularly true of barb and other fence wire. The leading interest reports a continued demand for nails. We continue to quote as follows: Plain wire, No. 9 and coarser, base, \$1.58; wire nails, \$1.78; painted barb wire, \$1.78 to \$1.83; galvanized, \$2.08; polished staples, \$1.83; galvanized, \$2.13, all Chicago.

Cast Iron Pipe.—The contracts for cast iron pipe at Cleveland, Ohio, for 3000 tons and at Cincinnati for 700 tons have been awarded to the United States Cast Iron Pipe & Foundry Company. The contract for 1100 tons for Webster Grove, Mo., was also awarded. A number of municipal lettings are pending for a considerable aggregate, the closing of which is anticipated within a fortnight. We quote as follows, per net ton, Chicago: Water pipe, 4 in., \$27; 6 to 12 in., \$25; 16 in. and up, \$24.50, with \$1 extra for gas pipe.

Philadelphia

PHILADELPHIA, PA., May 21, 1912.

On the whole the markets in all products are strong and in certain branches show a hardening tendency. In foundry pig iron the heaviest movement has been in low grades to pipe works, with moderate purchases of steel making iron. Quite an active movement in billets has developed, one contract for 10,000 tons of rolling billets being entered by an Eastern mill. Additional orders for vessels are reported placed with Chesapeake builders, while Delaware River yards are figuring on several boats. Iron bars are quiet, but with prices firm. The coke situation is still somewhat unsettled. A moderate movement in heavy melting steel scrap is reported, although other grades of old material are quiet.

Iron Ore.—Several cargoes of low phosphorus ore have been contracted for, although ordinary grades are quiet. Sales of domestic ore aggregating 50,000 tons

are reported. Importations during the week included 16,500 tons of Cuban and 16,994 tons of Swedish ore.

Pig Iron.—The principal movement in foundry grades has been confined to low grade irons to pipe foundries. Sales of 2500 tons of Northern high sulphur iron at \$14.50, delivered, several 1000-ton lots of ordinary low grade at \$14.75, and one moderate lot at slightly higher prices, as well as several thousand tons of Southern low grade, have been sold to Delaware River pipe foundries. One of the Virginia pipe makers, recently in the market for 3000 tons, is said to have purchased 6000 tons of No. 3 and forge grades for third quarter from the leading Virginia producer. The Baltimore Locomotive Works, which has been in the market for several thousand tons of low-silicon foundry iron, has not yet bought. Few consumers of higher grades of foundry iron are in the market for large quantities for early delivery, although inquiries for extended shipment are coming out against which the majority of producers still refuse to quote. Small sales of standard eastern Pennsylvania No. 2 X foundry for prompt delivery continue to be made at \$15.25 to \$15.50, delivered. Small sales are also reported in the higher Virginia foundry grades, which are firm at \$13, furnace, for No. 2 X, for delivery over the next few months. The majority of producers in this district are well sold up for second quarter and price concessions are disappearing. Some consumers are urging deliveries against contracts, which would appear to indicate that the melt is increasing. Little movement in rolling mill forge iron is noted and prices are quoted nominally at \$14.50 to \$14.75, delivered. Sales of basic iron have been made to consumers in the central part of the State, one 5000-ton lot being reported at \$15.25, delivered. While some little negotiation is reported for this grade in this district, no sales are reported. It now develops that in the recent basic buying movement on the part of one Eastern consumer purchases dating back almost a month, an aggregate of some 34,500 tons was purchased, largely at \$15, delivered, a large share for third quarter shipment. Producers are now holding at \$15.25 to \$15.50, delivered, for this grade. Large sales of low phosphorus and Bessemer iron have been made to a consumer in this district, but particulars are not available. Small sales of standard low phosphorus have been made at \$19.50 to \$19.75, delivered in this vicinity. Prices are firm, the following range being named for standard brands for prompt shipments in buyers' yards in this district:

Eastern Pennsylvania No. 2 X foundry....	\$15.25 to \$15.50
Eastern Pennsylvania No. 2 plain.....	14.75 to 15.00
Virginia No. 2 X foundry.....	15.80 to 16.00
Virginia No. 2 plain.....	15.55 to 15.75
Gray forge.....	14.50 to 14.75
Basic.....	15.00 to 15.50
Standard low phosphorus.....	19.50 to 20.00

Ferroalloys.—The stringency in the immediate supply of 80 per cent. ferromanganese has been somewhat relieved by the arrival of a cargo of about 3000 tons at this port. A large tonnage is now afloat, and a more normal supply against contracts is expected in the near future. Small sales for second half delivery to consumers in this district at \$48.50, Baltimore, are reported. Retail sales, involving a few tons, have been made for prompt shipment at \$65 to \$70 a ton, while moderate prompt lots are nominally quoted at \$55 to \$58, seaboard. Several small sales of 50 per cent. ferrosilicon have been made at \$70; delivered.

Billets.—An active demand for both rolling and forging billets is noted and Eastern producers are gradually getting order books filled for third quarter shipment. One order for 10,000 tons of rolling billets has been entered, along with smaller quantities. Sales of forging billets in 1000-ton lots have also been made. Prices of both rolling and forging billets are firm, and while the former grade is quoted at \$23.40 to \$24.40, the inside quotation is not always available for prompt shipment. Forging billets are on a base of \$28.40, delivered, for ordinary specifications.

Plates.—A very satisfactory current demand for heavy plates is reported. At some mills records as to the number of orders received during the week have been broken, but the aggregate tonnage holds at about an even basis. Considerable inquiry for ship plates is noted, including some general inquiry from abroad. Prices are being fairly well maintained at 1.40c. minimum, delivered here, for ordinary plates, although unconfirmed rumors of concessions on desirable orders are still heard.

Structural Material.—The bulk of the movement has been in small orders. The several large projects under negotiation are still unclosed. Few new propositions in large fabricated work have developed. Plain structural

shapes in miscellaneous lots command 1.40c., delivered, although desirable orders are still entered at 1.35c.

Sheets.—Mills continue to receive a fair volume of new business for prompt and near future delivery and are being operated at full capacity. Deliveries in some grades are difficult to obtain promptly. Prices are firm at 2.05c. to 2.10c., delivered here, for No. 28 gauge Western sheets, although Eastern mills, making smooth, loose-rolled sheets easily obtain from 1/4c. to 1/2c. per lb. advance.

Bars.—A moderate demand for iron bars is reported, some mills being fairly well booked for early delivery, and higher prices are quoted by certain makers. Ordinary iron bars are still available at 1.30c., delivered, although as high as 1.37 1/2c. is done for better grades. New orders for steel bars are unimportant, although specifications against contracts come out freely. Steel bars continue firm at 1.35c., delivered in this district.

Coke.—The movement is slow, although some few contracts for extended deliveries have been entered. Inquiries for second half are still before the trade, but large consumers and sellers are still apart as to prices. Prompt foundry has been sold at \$2.55 at oven, while some contracts have been entered at the same figure. Little movement in furnace coke is reported, although \$2.15 to \$2.25, according to grade, about represents the market for contract coke. The following range of prices, per net ton, about represents the market for deliveries in buyers' yards in this vicinity:

Connellsville furnace coke.....	\$4.25 to \$4.60
Connellsville foundry coke.....	4.65 to 4.85
Mountain furnace coke.....	3.85 to 4.20
Mountain foundry coke.....	4.25 to 4.45

Old Material.—While the general market drags, a trifle better movement in heavy melting steel scrap occurred during the opening days of the week, one Eastern melter taking on a number of 500-ton lots of strictly No. 1 material at \$13.50, delivered. A moderate lot of less desirable material was taken at \$13. Following recent heavy purchases of wrought turnings, prices, in the absence of demand, have sagged about \$1 a ton. While the market is not active, prices in general show little change. The following range of prices about represents the market for prompt deliveries in buyers' yards, eastern Pennsylvania and nearby points, taking a freight rate varying from 35c. to \$1.35 per gross ton:

No. 1 heavy melting steel scrap and crops.....	\$13.50 to \$14.00
Old steel rails, rerolling (nominal).....	14.75 to 15.25
Low phosphorus heavy melting steel scrap.....	16.25 to 16.75
Old steel axles.....	17.00 to 17.50
Old iron axles (nominal).....	23.00 to 23.50
Old iron rails (nominal).....	16.50 to 17.00
Old car wheels.....	14.00 to 14.50
No. 1 railroad wrought.....	15.75 to 16.25
Wrought iron pipe.....	12.50 to 13.00
No. 1 forge fire.....	12.00 to 12.50
No. 2 light iron (nominal).....	7.00 to 7.50
Wrought turnings.....	10.00 to 10.50
Cast borings.....	9.50 to 10.00
Machinery cast.....	13.75 to 14.25
Railroad malleable (nominal).....	12.00 to 12.50
Grate bars, railroad.....	10.50 to 11.00
Stove plate.....	10.50 to 11.00

Cleveland

CLEVELAND, OHIO, May 21, 1912.

Iron Ore.—The movement down the lakes has been considerably heavier during the week. The demand for contract boats is large and it is expected that considerable wild tonnage will be lined up within the next few days. By June 1 shipments will be very heavy. There is considerable complaint about the scarcity of labor at blast furnace plants and because of this some ore is being placed on docks that would otherwise be sent direct to furnace stock piles. The market is quiet but firm. A few sales of small lots were made in the week and some inquiries for small tonnages are pending. We quote prices as follows: Old Range Bessemer, \$3.75; Mesaba Bessemer, \$3.50; Old Range non-Bessemer, \$3.05, and Mesaba non-Bessemer, \$2.85.

Pig Iron.—A fair volume of orders for foundry iron in lots of 500 tons and under is coming out, sales being mostly for third quarter and last half delivery. There has been a further stiffening in prices and \$13.25, Cleveland furnaces, now appears to be the minimum quotation for No. 2 foundry for outside shipment. In the Valley foundry iron is firm at \$13.25 for delivery through the remainder of the year. Many of the smaller consumers in this territory have not yet covered for their last half requirements. Shipments are heavy and several producers are further reducing their stocks.

The second stack of the Toledo Furnace Company was blown in May 17. Southern is firm at \$11, Birmingham. There is little inquiry at present for Southern grades. We quote the following prices for prompt shipment and for the last half, delivered Cleveland:

Bessemer.....	\$15.15
Basic.....	13.50
Northern No. 2 foundry.....	\$13.25 to 13.50
Southern No. 2 foundry.....	15.35
Gray forge.....	12.75 to 13.00
Jackson silvery, 8 per cent. silicon.....	17.30 to 17.55

Coke.—Several inquiries for furnace coke for the last half are pending. There is also an inquiry for 12,000 tons of foundry coke for delivery during 12 months from July 1. Several offers of \$2.25 for furnace coke have been made but producers are asking \$2.35 to \$2.50. Foundry coke is quoted at \$2.50 to \$2.75 per net ton at oven for prompt shipment and contract. Buyers, however, are not placing orders for the last half. They are holding off with the hope of securing somewhat lower prices.

Finished Iron and Steel.—There is an improvement in the volume of new business in steel bars, plates and structural material. The market is very firm and regular prices are being maintained for current orders. There is considerable demand for steel bars for prompt shipment and because quick delivery cannot be generally secured local dealers able to ship at once are selling in small lots at an advance of \$1 a ton over regular prices. We note one sale of 200 tons for prompt shipment at 1.25c., Pittsburgh, or \$1 a ton above the market. Steel bars from warehouses are quoted at 1.65c. Considerable new business in structural material has come out, but in many cases bidders were protected a few weeks ago by mills for tonnage for this specific work and for that reason will get the steel at prices that prevailed before the recent advance. The Toledo Bridge & Crane Company, Toledo, Ohio, has taken 2400 tons for the Second National Bank Building of that city and 500 tons for a building for the Toledo Club. The Lake Shore Railroad has placed a contract with the Pennsylvania Steel Company for two new lift bridges, one at Buffalo and the other at Port Clinton, Ohio. One will take 1200 tons of steel and the other 900 tons. The Wellman-Seaver-Morgan Company, Cleveland, Ohio, has taken a coal handling plant for the Norfolk & Western Railroad that will require 900 tons of plates and shapes. Two new oil boats ordered from the American Shipbuilding Company by the Standard Oil Company will require about 3000 tons of plates and shapes. The steel will probably be furnished by the Carnegie Steel Company. We note the sale of 500 tons of 100-lb. standard section rails and about 100 tons of steel ties to an Ohio traction line. Plates are in good demand and the market is firm at 1.25c., Pittsburgh. Sheet specifications are good but new demand is not active. Black sheets are not firm. They are quoted at 1.90c. to 1.95c. for No. 28, but the lower price is being shaded by some sellers at least \$1 a ton. Galvanized sheets are firm at 2.95c. for No. 28. Forging billets are in fair demand in carload lots and are maintained at \$28, Cleveland. Rivets are very firm at 1.50c. to 1.55c., Pittsburgh, for structural and 1.60c. to 1.65c. for boiler rivets. Owing to the firmer scrap market local dealers have advanced price on iron bars \$1 a ton to 1.25c., Cleveland. The demand has improved somewhat and local mills expect to be able to run full until July 1.

Old Material.—The demand has improved considerably. Local dealers report the sale of a fair amount of scrap for shipment from Ohio points to Valley and western Pennsylvania mills. Local consumers are not taking much interest in the market. They still have fairly good sized stocks on hand. Railroad scrap sold last week brought good prices. The market is very firm, but prices are unchanged. Dealers' prices, f.o.b. Cleveland, are as follows:

Per Gross Ton.

Old steel rails, rerolling.....	\$12.75 to \$13.00
Old iron rails.....	14.00 to 14.50
Steel car axles.....	17.50 to 18.00
Heavy melting steel.....	12.00 to 12.25
Old car wheels.....	13.00 to 13.50
Relaying rails, 50 lb. and over.....	22.50 to 23.50
Agricultural malleable.....	10.50 to 11.00
Railroad malleable.....	12.00 to 12.50
Light bundled sheet scrap.....	9.50 to 10.00

Per Net Ton.

Iron car axles.....	\$18.50 to \$19.00
Cast borings.....	7.50
Iron and steel turnings and drillings.....	7.25 to 7.50
Steel axle turnings.....	7.75 to 8.00
No. 1 busheling.....	10.00 to 10.25
No. 1 railroad wrought.....	11.00 to 11.25
No. 1 cast.....	11.25 to 11.75
Stove plate.....	9.00 to 9.25
Bundled tin scrap.....	11.00 to 11.50

Cincinnati

CINCINNATI, OHIO, May 22, 1912.—(By Telegraph.)

Pig Iron.—It is reported that the situation in the Hanging Rock district is somewhat improved, that not much No. 2 foundry is available at \$13 Ironton, and that malleable makers are holding out firm for \$13.25 to \$13.50, which are the market quotations on No. 2 foundry. However, contracts running through the last half have been made for both grades at the first-named figure. The largest purchase reported is of 3000 tons of mixed analysis iron, including both Northern and Southern iron, as well as a quantity of high silicon for a Michigan melter. It is conceded even by buyers that \$11, Birmingham, is minimum on Southern No. 2 foundry, but a few producers are willing to book for the remainder of the year at this figure. A northern Ohio melter purchased 500 tons of No. 2 foundry for July-December shipment at \$11, Birmingham, and there are a number of smaller lots that were placed at this price, although \$11.25 to \$11.50 is minimum with a number of furnaces for third and fourth quarter shipment respectively. The lower grades are scarce, but a central Ohio firm was able to pick up 300 tons of Southern No. 3 foundry for last half at \$10.50, although the usual differential is now only 25c. a ton. The Ohio silvery irons are in better demand and prices have hardened. One local firm was able to sell 3000 tons of Jackson County 7 per cent. silicon analysis at \$16 at furnace. However, this figure represents the average quotation on 8 per cent. silicon. Few inquiries are out for either Northern or Southern iron, but several of those named last week are yet to be closed. The Globe Iron Company, making silvery iron, will blow out for repairs June 1. Based on freight rates of \$3.25 from Birmingham and \$1.20 from Ironton we quote, f.o.b. Cincinnati, as follows, for prompt shipment:

Southern coke, No. 1 foundry and 1 soft.	\$14.75 to \$15.00
Southern coke, No. 2 foundry and 2 soft.	14.25 to 14.50
Southern coke, No. 3 foundry	14.00
Southern coke, No. 4 foundry	13.75
Southern gray forge	13.75
Ohio silvery, 8 per cent. silicon	17.20 to 17.70
Lake Superior coke No. 1	14.70
Lake Superior coke No. 2	14.45
Lake Superior coke No. 3	14.20
Basic, Northern	14.45
Standard Southern car wheel	25.25 to 25.50
Lake Superior car wheel	19.00

(By Mail)

Coke.—A number of Eastern furnace interests are feeling the market, and it is also understood that Hanging Rock furnace operators are interested. Quite a lot of furnace coke will be contracted for before July 1, the date on which the majority of present contracts expire. The furnace owners are holding back on account of the advanced prices asked, but it is generally believed that they will have to pay these figures, unless conditions in the coke producing districts make a radical change soon. Connellsville furnace coke is quoted around \$2.35 to \$2.50 for contract business, but a few brands are now obtainable for prompt shipment as low as \$2.20 per net ton at oven. Pocahontas 48-hr. coke is unchanged at \$2 to \$2.15, for either prompt or deferred shipment, with Wise County brands quoted about 5c. to 10c. higher. In all three fields foundry coke is bringing from \$2.30 to \$2.50 per net ton at oven.

Old Material.—Several dealers report a much better demand, and prices on a few different classes of scrap material have advanced. Railroad offerings are heavier than for some time, and taking everything into consideration the market is in better shape. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations the selling prices f.o.b. at yards:

Per Gross Ton.	
Bundled sheet scrap	\$9.00 to \$9.50
Old iron rails	13.00 to 13.50
Relaying rails, 50 lb. and up.	20.25 to 21.25
Rerolling steel rails	11.25 to 11.75
Melting steel rails	10.25 to 10.75
Heavy melting steel scrap	10.25 to 10.75
Old car wheels	12.25 to 13.00

Per Net Ton.	
No. 1 railroad wrought	\$10.75 to \$11.25
Cast borings	6.50 to 7.00
Steel turnings	6.50 to 7.00
No. 1 cast scrap	11.00 to 11.50
Burnt scrap	7.75 to 8.25
Old iron axles	16.25 to 16.75
Locomotive tires (smooth inside)	12.00 to 12.50
Pipes and flues	7.25 to 7.75
Malleable scrap	8.75 to 9.25
Railroad tank and sheet scrap	6.75 to 7.25

Finished Material.—Nearly all mill agencies, as well as local dealers, report rather spotty conditions. One day may bring out some excellent business, while the next two or three days will develop a very lazy tendency on the part of buyers. The demand for structural material is fairly good, but does not meet the expectations of sellers in this territory, who were depending on open weather to start off a brisk buying movement. Mill prices on steel bars are firm at 1.20c. Pittsburgh, and on structural material 1.25c. is quoted. Warehouse prices are 1.65c. and 1.75c. respectively.

Birmingham

BIRMINGHAM, ALA., May 20, 1912.

Pig Iron.—It has been an uneventful week in pig iron. One of the largest dealers reports not making a single sale. A live brokerage firm reports the sale of 100 tons of No. 2 foundry at \$11 and 50 tons at \$11.50, both for spot use. There has been a decided falling off in orders and in inquiries. It is currently reported that the Republic Iron & Steel Company, which has three furnaces in operation, is on a selling basis of \$11.50 for the rest of the year, especially the last half. The Sloss-Sheffield, as previously reported, is on a basis of \$11.25 for spot and the third quarter and \$11.50 for the last quarter. One of the leading makers, adhering to the top-notch basis, is practically out of No. 2 and the low grades and is well sold up on its entire output, which to an extent puts it out of the competitive market for some time to come. On the other hand, a leading pipe interest declares that iron can be had at \$11. It is conceded that a large number of consumers have bought all the iron they will need for some time and this partly accounts for the dullness both in inquiry and bookings. At the same time the manufacturers are so well sold up and stocks have diminished so satisfactorily that they, too, feel like resting on their oars with present quotations. Small lots of charcoal iron are going at \$22 to \$22.50. With the varying positions of makers with regard to the price basis taken into consideration, the quotations on pig iron stand unchanged f.o.b. Birmingham as follows:

No. 1 foundry and No. 1 soft.	\$11.50
No. 2 foundry and No. 2 soft.	12.00
No. 3 foundry	10.50
No. 4 foundry	10.00
Gray forge	9.75
Basic	10.50
Charcoal iron	\$22.00 to 22.50

Cast Iron Pipe.—While no large offerings are in sight, there are a number of small ones, and bookings along that line are good. An inquiry for 1700 tons of gas pipe is pending. The general disposition of the pipe market is toward strength in response to that of the iron market, but makers have not as yet decided on any advance and none of a definite nature is under consideration. All the Birmingham district plants are reported operating on full time. Shipments have been somewhat hampered by the rainy weather, especially when they were intended for the West and Southwest. The outlook is considered good, even by the most conservative. Prices are still quoted as follows: 4 to 6 in., \$23; 8 to 12 in., \$22.50; over 12 in., average \$21.50.

Old Material.—Dealers report an active demand for No. 1 heavy cast and No. 1 railroad. They say inquiries from the East for deliveries 30, 60 and 90 days ahead are frequent. Stocks on yards are not large. The East is the principal taker of Birmingham scrap, the demand coming from foundries and rolling mills. Changes made some time ago in freight rates have somewhat hampered movements. Local consumption is fair, especially as regards heavy cast. There have been few changes in prices, the revised quotations this week f.o.b. dealers' yards being as follows:

Wrought iron car axles	\$16.00 to \$17.00
Old steel axles	14.50 to 15.50
Old iron rails	14.50
No. 1 railroad wrought	12.50 to 13.00
No. 2 railroad wrought	11.50
No. 1 country wrought	10.00 to 10.50
No. 2 country wrought	9.00 to 9.50
No. 1 machinery	8.50 to 9.00
No. 1 steel	9.50 to 10.00
Tram car wheels	9.50 to 10.00
Standard car wheels	11.00 to 11.50
Light cast and stove plate	8.00 to 8.50

Coal and Coke.—After four months of full operations and big sales the coal trade is easing up. Owing to apprehension of labor trouble during the early spring all sorts of consumers laid in large supplies of coal, especially railroads. However, when the wage advances were granted, effective May 1, and all danger of labor trouble had gone a survey of stocks on hand was taken and orders and output have slackened. The floods in

the Mississippi Valley have hampered shipments and cut off much business ordinarily going that way at this season. There have been no cuts in prices. Owing to general activity in manufacturing plants a rather better than usual summer trade is expected. The coke market is featureless. No Virginia coke is coming in and local sales are not noteworthy. Good foundry grades continue to command \$3.25 to \$3.75 per net ton f.o.b. cars at oven.

Boston

BOSTON, MASS., May 21, 1912.

Old Material.—The market is a trifle stronger, with a fair volume of transactions. Conditions are rather better than the dealers had anticipated, but no advance in prices is looked for, chiefly because June and July are usually dull months. Quotations are unchanged. The prices quoted below are those offered by the large dealers to the producers and to the smaller dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points, taking Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of \$2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices.

Heavy melting steel	\$10.25 to \$10.75
Low phosphorus steel	11.45 to 11.95
Old steel axles	14.00 to 14.50
Old iron axles	17.00 to 18.00
Mixed shafting	13.00 to 13.50
No. 1 wrought and soft steel	10.00 to 10.50
Skeleton (bundled)	8.25 to 8.75
Wrought iron pipe	9.25 to 9.75
Cotton ties	7.75 to 8.25
No. 2 light	4.50 to 5.00
Wrought turnings	7.25 to 7.75
Cast borings	6.25 to 6.75
Machinery, cast	12.50 to 13.00
Malleable	8.75 to 9.25
Grate bars	6.00 to 6.50
Stove plate	8.00 to 8.50
Cast iron car wheels	11.75 to 12.00

St. Louis

ST. LOUIS, MO., May 20, 1912.

While trade generally is quiet, it is not because of any special lack of volume in the totals, but rather because there are no large inquiries or sales under way. Most of the business now is of the quick consumption order and the chief difficulty is to get deliveries. Collections continue comfortable.

Pig Iron.—Sales continue to be of small lots and there have been no large inquiries. Prices are firmer than ever and \$11.25 for last half with \$11.50 for last quarter are the prevailing figures for No. 2 Southern, Birmingham basis. Representatives are finding it harder to get their furnaces to accept orders at current prices than to get buyers to commit themselves. No. 4 Southern continues very scarce.

Coke.—Very little is doing, with prices none too well held at recent quotations. By-product coke is quiet at last figures. There are no inquiries and there is some pressure to sell which may drive prices down a little.

Old Material.—The scrap market is growing stronger and more active every day and a majority of the items are marked up this week. The rolling mills are actively in the market and all the steel consumers are looking for bargains. The dealers are firm at their own prices and in the improved situation look for further advances every day. In general the situation is very satisfactory with an exceptional request for relaying rails. We quote dealers' prices, f.o.b. St. Louis, as follows:

Per Gross Ton.	
Old iron rails	\$14.00 to \$14.50
Old steel rails, re-rolling	12.00 to 12.50
Old steel rails, less than 3 ft.	12.00 to 12.50
Relaying rails, standard section, subject to inspection	22.00 to 22.50
Old car wheels	13.00 to 13.50
Heavy melting steel scrap	12.00 to 12.50
Frogs, switches and guards cut apart	12.00 to 12.50
Per Net Ton.	
Iron fish plates	\$13.00 to \$13.50
Iron car axles	18.00 to 18.50
Steel car axles	16.00 to 16.50
No. 1 railroad wrought	12.00 to 12.50
No. 2 railroad wrought	11.50 to 12.00
Railway springs	10.50 to 11.00
Locomotive tires, smooth	12.50 to 13.00
No. 1 dealers' forge	8.50 to 9.00
Mixed borings	6.75 to 7.25
No. 1 busheling	9.50 to 10.00
No. 1 boilers, cut to sheets and rings	8.00 to 8.50
No. 1 cast scrap	11.00 to 11.50
Stove plate and light cast scrap	8.50 to 9.00
Railroad malleable	10.00 to 10.50
Agricultural malleable	8.50 to 9.00
Pipes and flues	8.50 to 9.00
Railroad sheet and tank scrap	8.00 to 8.50
Railroad grate bars	9.00 to 9.50
Machine shop turnings	7.50 to 8.00

Finished Iron and Steel.—A notable feature of the situation is an insistent demand for quick delivery of plates and offers of premiums for early shipment. On general orders deliveries have become more extended. In standard steel rails the only order of the week was for 2500 tons for a new road in Montana, to be delivered during the summer. Southwestern roads which are expected to come into the market for further supplies have not made final decisions and will probably delay them to the close of the railroad fiscal years if conditions make it possible. Light rails have been in light request, but expected activity in the lumber lines promise demand from that quarter in the near future. Structural material has been moving freely, with no large individual orders. In all divisions the latest quotations are very firmly held.

San Francisco

SAN FRANCISCO, CAL., May 14, 1912.

The Pacific coast steel trade has been gradually improving since the end of March, and is now in fairly satisfactory shape. While a large volume of business has been brought out by the stiffening of prices in the East, the activity is due largely to an actual increase in current requirements. Local buyers, who have limited their purchases closely for a year or more, are now satisfied of the stability of prices at the recent advance, and have been coming into the market on a fairly large scale. All requirements to July 1 are pretty well covered, and some orders have been placed for third quarter delivery, but a good many late buyers find it impossible to get anything beyond the second quarter at the old prices. There is some anticipation of further advances, however, and inquiries for extended delivery are still coming out. Distributive trade the last three weeks has been far ahead of the same period of 1911, though the volume varies greatly from day to day.

Bars.—Manufacturing interests all over the State have been buying freely, though it is understood that a good many failed to cover their needs for the remainder of the year before the advance took effect, and some merchants are said to be in the same position. Contracting on the new basis is more general than might be expected, though the movement has naturally fallen off somewhat. Specifications are heavy, as the small trade through the country is taking a comparatively large tonnage, and the outlook for the remainder of the year is encouraging. The demand for reinforcing steel for local building work is active, and some fairly large orders have been placed. Jobbing prices are unchanged, bars from store, San Francisco, being quoted at 2.25c. for soft steel and 2.15c. for iron.

Structural Material.—Local building permits for April totaled \$1,916,659, a sharp reduction from the previous month, though better than the same month last year. Conditions in other coast cities are encouraging, Los Angeles, San Diego, Portland and Seattle showing a marked increase, aside from a good volume of work in the country. Steel contracts, however, are slow to materialize, and such small jobs as are let still arouse close competition among local fabricators. The advance on shapes has failed to hasten the letting of the several large jobs in prospect, though there are a number that may be closed at any time. The Central Iron Works has a small job on a building at Jessie and Annie streets, the Ralston Iron Works has the Greninger building contract, and the Judson Mfg. Company has the garbage incinerator job, amounting to \$6,500. The Geary street power house inquiry has been withdrawn, the city having decided to buy its power. Foundation plans for the local armory are out, and the steel inquiry will come up shortly. The general contract has been let for piers 30 and 32, and Dyer Brothers will erect a bridge over Beale street for the city. The Llewellyn Iron Works is said to have the Rosslyn Hotel at Los Angeles. The Tivoli Theatre contract in this city is still withheld.

Rails.—Local sales of both light and standard sections have been larger, but there is no very heavy movement. The mining interests are now giving more attention to light rails, and the stiffening of prices brought out some business from merchants. A few fair logging inquiries are coming out, but old rails may be purchased, the supply of relaying rails on the coast being fairly large. Surveys are being made for several interurban extensions, but no large inquiries from such sources have come out lately.

Sheets.—Pipe manufacturers and other large consuming industries have their current requirements

pretty well covered, and new business is naturally a little quiet, but specifications continue to come out on a large scale. Distributive business in all lines of sheets is well maintained.

Plates.—Some improvement is noted in the jobbing movement, though plates are still rather quiet in comparison with other products. The tonnage recently placed for large tank construction, however, is comparatively large, and a number of new inquiries are expected. The Esperanza Oil Company has divided its tank contract between two Los Angeles firms, the Llewellyn Iron Works and the Lacy Mfg. Company, and another oil distributing project is talked of at that point. The Long Beach Consolidated Gas Company, Long Beach, Cal., is also planning a new plant. The Lilley & Thurston Company has a contract for steel doors for piers 30 and 32, this city, at about \$70,000.

Merchant Pipe.—General trade in the oil fields has improved slightly, and the outlook there is much better. The demand for irrigation purposes has fallen off somewhat, but pump firms are still handling a large tonnage. The local plumbing supply trade has picked up a little, and jobbing trade through the country is the best in many months.

Cast-Iron Pipe.—Small orders are coming out more freely, and some important inquiries are taking definite shape. A contract for 1000 ft. of 6-in. pipe for Santa Cruz, Cal., has been placed with the American Cast Iron Pipe Company, Birmingham, Ala. The town of Glendora, Cal., will take bids June 4 for a franchise to lay an 8-in. distributing system, and an extension is planned for the gas system at Porterville, Cal. The town of Colton, Cal., has just received bids for 1275 ft. of 10-in. pipe, and the town of Pasco, Wash., is taking figures on a lot of pipe from 6 to 14-in. The city of Oakland, Cal., has appropriated \$13,900 for the extension of its high pressure auxiliary system.

Pig Iron.—Coast foundry requirements are increasing but slowly, and most melters have material on hand for all immediate needs, though the surplus stock is gradually diminishing. At the moment, however, there is no business of any consequence. Foreign iron is nominal in value, No. 2 Southern foundry iron being quoted at \$21.

Old Material.—The principal transaction in scrap is the sale of the present Geary street railroad, except cars, to the San Francisco Iron & Metal Company. The material to be removed is estimated at about 2000 tons, consisting of rerolling rails and steel melting scrap. Steel melting scrap continues strong, and recent sales will take up most of the present accumulations. Rerolling rails, also, are kept fairly well cleaned up by old contracts, but other lines of scrap are quiet. Prices are as follows: Cast-iron scrap, per net ton, \$14; steel melting scrap, per gross ton, \$11.50 to \$12; wrought scrap, per net ton, \$12.50 to \$15; rerolling rails, per net ton, \$11.

Woods & Huddart, iron and steel, have removed from 356 Market street to 444 Market street, San Francisco, Cal.

Buffalo

BUFFALO, N. Y., May 21, 1912.

Pig Iron.—The aggregate of sales for the week makes only a moderate total—not over 12,000 tons of all grades. This is made up principally of small lots of 100 to 500 tons. One sale of 1000 tons of malleable is reported, taken at \$14.25 at furnace. The bulk of the new orders comes from the smaller melters, most of the large consumers being apparently pretty well covered for their present estimates of last half requirements. Business amounting to a considerable tonnage from various sources on quotations recently made is still pending, however, so that the situation represents very healthful market conditions. With one or two exceptions furnaces are not seeking business aggressively, their order books for the third quarter and last half being comfortably filled. They are consequently holding more stiffly for the maximum of price schedules, with probability of advances being made in the near future. We quote as follows for current quarter and last half, f.o.b. Buffalo:

No. 1 X foundry	\$14.00 to \$14.50
No. 2 X foundry	13.75 to 14.25
No. 2 plain	13.50 to 14.00
No. 3 foundry	13.50 to 13.75
Gray forge	13.25 to 13.75
Malleable	14.25 to 14.50
Basic	14.25 to 14.50
Charcoal according to brand and analysis	15.75 to 17.00

Finished Iron and Steel.—Considerable inquiry is noted for plates, shapes and steel bars, but placement is restricted because mills are not in position to accept orders for prompt delivery. Some mills have been obliged to decline such business, it being the evident policy to give preference to regular customers on orders already booked. Premiums are obtainable by some of the smaller mills for prompt shipments from stock or immediate future rollings, as well as by warehouses. Schedule prices are firmly held at 1.20c., Pittsburgh, base, for steel bars and 1.25c. for plates and shapes, and the indications are that if tonnage continues to be offered at the rate it has been the past week there will be a further advance in the near future, possibly by June 1. Heavy demand is noted for concrete reinforcing bars. Cold rolled shafting is also in fair demand and prices are advancing. Bolt makers are specifying in good volume against contracts. The price of tin plate has been advanced 10c. per base box by the principal producers to \$3.50 per box. Some business is being done in sheet piling, mostly for Erie barge canal work. An inquiry is also reported for 800 tons of sheet piling from a Hamilton, Ont., contractor. An order for 2500 tons of heavy steel rails has recently been placed locally by the International Traction Company, Buffalo.

In fabricated structural material a fairly large amount of business is in evidence: Several local commercial and office building projects being nearly ready for figuring, also plans for a large manufacturing plant at Niagara Falls. The Buffalo Structural Steel Company has been awarded the contract for the J. N. Adams Company Department Store Annex, 300 tons, and 100 tons for an addition to the plant of the Buffalo Foundry & Machine Company. The Thompson-Starrett Company has received general contract for the 8-story office building for the Buffalo Natural Gas Fuel Company requiring about 700 tons of steel. The Lackawanna Bridge Company has the contract for a small bridge for the Rutland Railroad. The Great Lakes Dredge & Dock Company, Chicago, was low bidder at \$126,871 for the steel bascule bridge across the U. S. Ship canal and Black Rock harbor at the foot of West Ferry street, Buffalo.

Old Material.—Although local demand has not improved materially, there is rather more inquiry from outside districts and shipments to such districts have increased. This is true especially of wrought scrap for which commodity prices have increased 50c. to 75c. per ton. Prices for other lines of old material have also strengthened slightly; except for malleable scrap. We quote as follows, per gross ton, f.o.b. Buffalo:

Heavy melting steel	\$12.75 to \$13.25
Low phosphorus steel	15.75 to 16.00
No. 1 railroad wrought	14.00 to 14.75
No. 1 railroad and machinery cast scrap	13.50 to 14.00
Old steel axles	16.50 to 17.25
Old iron axles	21.00 to 21.50
Old car wheels	12.50 to 13.00
Railroad malleable	11.50 to 12.25
Boiler plate, sheared	13.75 to 14.25
Locomotive grate bars	11.00 to 11.25
Wrought pipe	9.50 to 10.00
Tank iron	10.00 to 10.25
Wrought iron and soft steel turnings	8.00 to 8.50
Clean cast borings	7.00 to 7.50

The German Iron Market

Reports Continue Cheerful

BERLIN, May 9, 1912.

The firm position of the iron market remains unchanged. There were rumors this week that price-cutting in B products had begun and this caused a temporary break in iron shares on the Stock Exchange, but the next day the report was denied and the course of quotations became again upward. This rumor was evidently born of the belief that sooner or later prices in the non-syndicated products will be cut owing to heavier production and sharper competition.

A New Record for Pig Iron Production

The April figures for pig iron production show a new high record. The total was 1,427,559 metric tons, or nearly 3500 tons more than in the longer month March; it was 132,000 tons above the make for April, 1911. For four months the gain over last year amounted to 435,000 tons.

The upward tendency of prices continues. On the Düsseldorf Exchange on Friday the quotation for basic steel bars was 117.50 to 122.50 marks, as against 115 to 120 marks for the previous trading day; ordinary iron bars were quoted at 140 to 143 marks, as compared with 135 to 138 marks. Export prices are also still rising; it

is asserted that the price of good German basic bars f.o.b. Antwerp is now 117.50 to 120 marks. The Prussian railroads have just renewed their contracts with the Steel Works Union for rails and other supplies at an average increase of 2 marks a ton, and it is expected that contracts with the railroads of the other German states will be arranged at a similar advance. From Brussels it is reported by wire that a further advance of 2 shillings has been made in the export prices of bars of both basic steel and wrought iron and also in plates and sheets.

The market reviews all agree in representing the general position of the trade as highly satisfactory. Of course, in some departments where orders have already been placed for months ahead new business is necessarily coming in rather slowly, but specifications on such orders are being sent in fast. In addition to the price advances already mentioned it is pretty generally expected that a higher level will be adopted by the Union for semi-finished material. If this is done various finished products will necessarily have to be raised.

Ore and Pig Iron

The ore market shows little change. The mines are able to market their entire product without difficulty and orders both for minettes (of the Lorraine-Luxemburg district) and for the superior ores of the Siegerland and adjacent regions run to the end of the year. Prices are well maintained. German smelters availed themselves of the English coal strike and the cheaper freights resulting from Spain to place large orders for Spanish ores. The price of 50 per cent. Spanish hematite ores on the lower Rhine is now 19 to 20 marks a ton.

The production of ferromanganese has been rendered more difficult through the interruption of imports of rich manganese ores from the Caucasus by the closure of the Dardanelles, necessitating substitute purchases from eastern Asia at higher prices. Business in Mediterranean ores is also restricted by reason of high freight rates. Imports of foreign ores in April reached 1,153,400 tons, as against 1,208,100 tons in April, 1911.

The position of the pig iron market is unusually satisfactory, although shipments in April did not reach quite so high a percentage of the allotments as in March—86 per cent. for April, as against 91 per cent. in March—and it is admitted that stocks with dealers have increased somewhat. The furnaces are so fully sold out for the rest of the year that it is difficult to accommodate supplementary orders. The great mixed establishments are more disposed to buy than sell pig. The higher prices now prevailing in England as the result of the great coal strike have strongly stimulated the German export trade; the outgo in April reached 96,371 tons, as compared with 63,793 tons in April, 1911. From the Luxemburg-Lorraine district a scarcity of the grades produced there is reported and an advance of prices—some say as much as 5 marks—is looked for. There is a very active demand in that region and dealers are sold out. Prices for scrap and old iron are steady; a large volume of material is coming upon the market, but there is also an ample demand.

The Steel Trade

Work on semi-manufactured steel material has grown more active within the past few weeks owing to the fact that a considerable volume of orders for England, which had been held up by the coal strike there, are now being filled. The mills of the Union are already so well supplied with orders that they are hardly in a position to take further engagements for the current quarter. The export demand is active at rising prices. Billets now command 95 to 97 marks f.o.b. seaport, and slabs 99 to 100 marks. The demand for beams and other structural shapes is heavy, and buying has grown more active of late. The recent advance of prices in England may cause the Union to adopt higher prices for the next quarter; the matter will be decided later. Dealers are trying to place with makers as large orders as possible in expectation that prices will be advanced.

The demand for bars has been very heavy for some weeks owing to the English strike and export prices have risen. From the Luxemburg-Lorraine district it is reported that export prices are now about equal to home prices, if not higher. Orders for longer periods than usual are now coming in at the mills. On the other hand, according to one market review dealers are holding back with orders for bars till they see what course prices will take after the restriction of production has been completely abolished at the end of June through lapse of the arrangement with the Union. Business in iron bars is also very brisk. Large orders have recently been placed for band iron and the mills are said to have about all they can do for the rest of the year. In cold-

rolled steel the price of 205 marks has been left unchanged for the next quarter. The mills are well employed, and foreign orders have increased. Great activity prevails in strips for steel tubing. The tube mills themselves have recently taken very large orders and prices are somewhat firmer; export business in steel tubing is increasing.

Business continues quite satisfactory in plates and sheets; the export demand is very large. In ship plates manufacturers are compelled to stipulate about a year ahead for filling orders. Export business in wire rods has undergone a big increase. Shipments in April were even larger than for March, the foreign market being responsible for more than the total gain. Higher prices are obtained on foreign orders. Wire mills and dealers in rods have been disposed to increase their takings, fearing that higher prices will be adopted later on. Business in wire is active, but prices remain unsatisfactory.

The Rheinische Stahlwerke has decided to erect several furnaces in connection with its new open-hearth plant. August Thyssen, the well-known great iron-master, has sold to a French syndicate his furnace plant at Caen, Normandy, retaining, however, a minority of the stock. It is intimated that this decision was caused by certain legal difficulties encountered in the course of the development of the undertaking.

Ferromanganese Advanced

British Iron Market Firm, and Sheet Bars for Prompt Delivery Have Sold Higher

(By Cable)

MIDDLESBROUGH, ENGLAND, May 22, 1912.

The iron market still shows firmness, but without particular developments, though the general demand seems rather less urgent. The reduction in pig iron stocks goes on and furnaces are not yet fully working, though coal is now in a normal position.

Semi-finished steel is very firm, 120 shillings having been paid for Welsh sheet bars for prompt delivery. Germans and Belgians are still making no offerings of sheet bars. Some good lots of American open hearth blooms are under negotiation, also American structural steel, but the business is contingent upon freight arrangements.

Ferromanganese for America has been advanced \$2.50 to \$48.50, Baltimore. Tin plates are in poor demand, and the market is rather easier. We quote as follows, advancing last week's prices on rails and Welsh sheet bars:

Cleveland pig iron warrants (closing Tuesday), 53s. 11½d., against 54s. 1½d. one week previous.

No. 3 Cleveland pig iron, maker's price, f.o.b. Middlesbrough, 54s. 6d., a decline of 3d. due to speculative realizing.

Steel sheet bars (Welsh) delivered at works in Swansea Valley, £5 17s. 6d.

German 2-in. billets, f.o.b. Antwerp, 100s.

German basic steel bars, f.o.b. Antwerp, £5 14s. to £5 15s.

Steel bars, export, f.o.b. Clyde, £7 12s. 6d.

Steel joists, 15-in. export, f.o.b. Hull or Grimsby, £6 17s. 6d.

Steel ship plates, Scotch, delivered local yard, £7 14s. 9d.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 5s.

Steel rails, export, f.o.b. works port, £6 7s. 6d.

Tin plates, cokes, 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 14s. 7½d., October-December.

(By Mail)

Fuel Supply Still Light

MIDDLESBROUGH, May 10, 1912.

Supplies of fuel are still light in many directions, consequently the full resumption of operations has not yet been possible, though each day sees a nearer approach to it. Progress in restarting the blast furnaces has been unexpectedly slow, but owners have undoubtedly been acting wisely in refusing to light up until they had accumulated a sufficient stock of fuel to feel comfortable. This, of course, takes time, for the earlier supplies of coal which were raised had to be rushed away to consumers, coke making coal being available later on. As the consuming works are now running full, the demand for raw material has naturally to be met from stocks, and this tendency is seen in the steady rate of withdrawals of pig iron from the warehouses in Middlesbrough. Elsewhere in producing areas the restoration of more normal conditions has been accompanied by a rise of several shillings a

ton in prices. Staffordshire common pig iron, which before the strike stood at 51s., is now quoted at 57s. 6d., while another brand has moved from 54s. 6d. to 62s. and Derbyshire forge from 56s. to 62s. 6d. These movements are merely typical of what has been seen elsewhere.

Finished Material Markets Strong

Bar iron remains firm, best qualities being held for £9 by Midland makers, with second grades at £8 5s. and common sorts ranging from £7 12s. 6d. to £8. In Lancashire the position of the bar iron trade is equally strong and home grades are quoted at £7 17s. 6d. to £8, while for export qualities £7 15s. f.o.b. Liverpool, is required. The strength of steel is unabated and general reluctance to quote is observable for works books are congested with business.

There has been quite a big rush of demand for tin plates and many makers find themselves in the tantalizing position of holding heavy order books with only partly running plants, because of the difficulty of getting fuel and bars. The semi-finished steel position is indeed a very acute one and both the tin plate manufacturers and the galvanized sheet makers are frequently put to it to get raw material. One big works which was recently offered a large line of American bars and showed no interest in such straits now for deliveries as lately to have bought a 5-ton lot out of a sample shipment, this paltry quantity being sent by rail a couple of hundred miles or so from the port at which it was landed to the mills on the opposite side of the country.

The shipbuilding returns for April are wonderfully good, the total put into the water on the Clyde, for example, being 65,700 tons, making the total for four months over 200,000 tons, while additional work is being booked almost daily. The big Elswick firm of Armstrongs has this week been commissioned by the Chilean Government to build three Dreadnaughts of 27,000 tons each, carrying heavy armaments.

The Continental Situation

The renewal of the German Verband was generally expected in the best informed quarters, but none the less the official announcement of its reconstitution for five years, though on a more restricted basis than before, was received with something like relief. At the same time, considering the wonderful activity of trade and the congestion of orders, the complete breakdown of negotiations might have entailed not more than a passing phase of depression. Of semi-finished steel the German works are by no means anxious sellers and have several times raised their prices of late, though probably last quarter is the earliest date for which new business can be booked. A similarly firm situation exists in Belgium. No sufficient harmony of interests was possible as regards the Verband to maintain bar iron and the other products included in the B group within the sphere of influence of the central organization, but these it is fully expected will be dealt with on separate lines at a later date.

New York

NEW YORK, May 22, 1912.

Pig Iron.—The buying movement in pig iron in the East has subsided further and it would appear that a quiet time is ahead for blast furnace companies. New England buyers and others supplied through New York pig iron offices seem to have covered their needs for the next four months and some of them for five or six months. Eastern furnace capacity is limited and any recession in prices that may occur in the quiet months just ahead is not so likely to be due to the initiative of Eastern producers as to the possibility that the large capacity furnaces on the Lakes may go after business more vigorously. There is so much iron booked, however, that this contingency is not immediate. In the past week a fair amount of business has been done by sellers who did not book ahead quite so freely as others in the April movement; but others who last month disposed of their product for some months ahead are resting on their oars. The melt continues at a fair rate and it still seems to be the case that consumption slightly exceeds production. Virginia irons are inactive and there is very little Eastern selling of Alabama iron following the recent purchases of pipe companies. We quote as follows for Northern iron at tidewater: No. 1 foundry, \$15.25 to \$15.50; No. 2 X, \$15 to \$15.25; No. 2 plain, \$14.75 to \$15. Southern iron is quoted at \$15.50 to \$15.75 for No. 1 foundry and \$15 to \$15.25 for No. 2 foundry.

Finished Iron and Steel.—There is a lull in new demand, though it is believed that it is incidental and temporary. Operations on the basis of specifications against contracts continue, of course, at a remarkably high rate, and more is heard of extended deliveries and of the fact that rolling schedules, on account of their being settled for so long a time in advance, are no longer of any direct interest to the sales offices. There is reason to believe that the shading of 1.25c. for plates has been almost altogether eliminated. The situation in the bar iron division of the market is generally expressive of what is obtaining in other finished lines, namely, that there has been no further increase in the volume of bar iron orders, but the rate at which orders come in is good. Manufactured iron products, such as bolts, nuts and the like, are moving in large volume. Bolts and nuts have again been advanced. The one present source of promising activity is the railroad buying. For example, the Boston & Maine late last week inquired for about 5300 cars and 150 locomotives and the New Haven is considering perhaps 6000 flat cars. The Boston & Maine cars include 2300 hoppers, 1600 box, 300 automobile, 150 passenger and the remainder are refrigerator, flat, heater, caboose and 500 ice cars. Bids are now in for the 14,000 tons of steel work for the Biltmore Hotel at the Grand Central terminal; the buildings at the site of the 7000-ton Adams Express building are being razed; bids have again been taken for the 1700-ton barge canal bridge for the New York Central at Oswego and other new business in structural lines includes the following: 2000 tons for a 16-story loft building at Twenty-ninth street and Fourth avenue; about 2000 tons for a 16-story loft building at 16 West Forty-fifth street; 1000 tons for the Building of Journalism, Columbia University; 400 tons for two bridges at White Plains for the New York Central, and 200 tons for two bridges, Vernon, Vt., for the Boston & Maine. The American Bridge Company is to supply the 1500 tons required for the eight bridges near Carbondale for the New York, Ontario & Western and the Boston Bridge Works is to supply the 1000 tons for the Hamden Railroad bridge at Chicopee, Mass. Quotations are: Steel bars, plain structural material and plates, 1.36c. to 1.41c.; bar iron, 1.30c. to 1.35c., all New York. Plain material from store, New York, 1.75c. to 1.85c.

Cast Iron Pipe.—As it is understood that a portion of the funds accruing from the recent large sale of bonds will be applied by the city of New York to important extensions of water service, the cast iron pipe trade is in expectation of an early announcement of contracts to be placed involving a very heavy quantity of cast iron pipe. It is the belief that lettings may be announced in June. Meanwhile pipe buying is quiet, no lettings of importance being before the trade in this section of the country. Private business is fair. Carload lots of 6 in. are to be had from some makers at \$21, tidewater, per net ton, while others will not sell under \$22 to \$23.

Old Material.—Transactions in heavy melting steel scrap in this locality have been a little more plentiful, but the quantities involved seldom ran over a few hundred tons. Holders are still confident that their patience will be rewarded by higher prices and are not pressing stocks on the market. Eastern Pennsylvania steel scrap consumers are lowering their offers but dealers who made sales some time ago are quietly buying to cover such contracts and prices therefore appear to be maintained. Rolling mills are in the market to some extent, but are inquiring for specialties so that such staple articles as wrought scrap, borings and turnings are somewhat weaker. Foundries are taking but moderate quantities of cast scrap. Dealers' quotations are as follows per gross ton, New York and vicinity:

Old girder and T rails for melting.....	\$11.25 to \$11.50
Heavy melting steel scrap.....	11.25 to 11.50
Relaying rails.....	20.00 to 20.50
Rerolling rails (nominal).....	12.50 to 13.00
Iron car axles.....	21.00 to 21.50
Old steel car axles.....	15.00 to 15.50
No. 1 railroad wrought.....	13.25 to 13.75
Wrought iron track scrap.....	12.00 to 12.50
No. 1 yard wrought, long.....	11.50 to 12.00
No. 1 yard wrought, short.....	11.25 to 11.50
Light iron.....	5.00 to 5.25
Cast borings.....	7.00 to 7.25
Wrought turnings.....	8.00 to 8.25
Wrought pipe.....	10.25 to 10.75
Old car wheels.....	13.50 to 14.00
No. 1 heavy cast, broken up.....	11.75 to 12.25
Stove plate.....	9.00 to 9.50
Locomotive grate bars.....	8.75 to 9.25
Malleable cast.....	10.00 to 10.50

Ferroalloys.—The market for 80 per cent. ferro-manganese is strong at \$48.50, Baltimore, forward delivery, and large sales at that price are reported. Spot

ferromanganese is not easy to find and quotations are from \$56 to \$58, although some business has been done at \$54. There is, however, no great demand for spot delivery. Inquiries are light for 50 per cent. ferro-silicon, which continues to be quoted at \$70, Pittsburgh, for carload lots and lower for larger quantities.

Metal Market

NEW YORK, May 22, 1912.

The Week's Prices

Cents Per Pound for Early Delivery.

Copper, New York.		Tin.		Lead—		Spelter—	
May.	Lake.	Electro-lytic.	New York.	New York.	St. Louis.	New York.	St. Louis.
16.....	16.37½	16.12½	46.55	4.20	4.07½	6.85	6.70
17.....	16.37½	16.25	46.40	4.20	4.07½	6.85	6.70
18.....	16.37½	16.25	....	4.20	4.07½	6.85	6.70
20.....	16.62½	16.37½	45.95	4.20	4.07½	6.85	6.70
21.....	16.62½	16.37½	45.70	4.20	4.07½	6.85	6.70
22.....	16.62½	16.37½	45.50	4.20	4.07½	6.85	6.70

Copper, after big sales, is quiet but firm. Tin is inactive and weaker. Lead is a little stronger. Better brands of antimony are unchanged in price, but a little stronger.

New York

Copper.—After a flurry of buying the copper market is again quiet but firm. Sales of the last week or ten days ran into millions of pounds, with most of the selling at prices between 16c. and 16.25c. Some estimates place the amount ordered by consumers at between 25,000,000 and 30,000,000 lb., but these figures are purely supposition. The big sales were made quietly and given no publicity, but it is generally believed that the General Electric Company was the largest buyer at about 16c. just prior to an upward movement in prices. In fact heavy buying by that interest accelerated the advance. Not much of the buying was for August delivery and some interests say they expect to see Lake copper at 16.75c. for that month. The lowest prices at present are those of the United Metals Selling Company, which is quoting 16.50c. for electrolytic, 30 days delivered, equivalent to 16.37½c. cash New York. Other producers and holders are asking 16.45c. to 16.50c. cash, New York. The exports for the month total the fair aggregate of 16,762 tons. The price of copper in London to-day is £74 1s. 3d. for spot and £74 8s. 9d. for futures.

Pig Tin.—Quiet conditions have prevailed throughout the week in pig tin, the business here being principally between dealers, with little of the metal sold into consumption. Consumers are well filled for present needs and are not buying futures to any great extent. They appear disposed to wait in the matter of providing for their future needs, which accounts for the lack of activity and has caused lower prices, that quoted to-day being 45.50c. There is an ample supply of tin on hand, but most of it is owned by London interests who are confronted by lower prices here than exist in London and there is no disposition on their part to force sales. Spot tin is quoted in London to-day at £207 and futures at £202 5s. The arrivals of tin this month were 1761 tons and there is afloat 2480 tons.

Tin Plates.—Demand continues good for tin plates and the American Sheet & Tin Plate Company has advanced its price 10c. per base box. The price now quoted in New York for 100-lb. coke plates by the lowest sellers is \$3.64.

Old Metals.—The market continues strong. Dealers' selling quotations have again been advanced on all copper and brass products and are now as follows:

	Cents per lb.
Copper, heavy and crucible.....	15 to 15.50
Copper, heavy and wide.....	14.75 to 15.00
Copper, light and bottoms.....	13.50 to 13.75
Brass heavy.....	10.00 to 10.25
Brass, light.....	8.00 to 8.25
Heavy machine composition.....	12.75 to 13.00
Clean brass turnings.....	9.50 to 9.75
Composition turnings.....	11.25 to 11.75
Lead, heavy.....	4.00
Lead, tea.....	3.75
Zinc, scrap.....	5.50

Lead.—A quiet but somewhat firmer situation exists in the lead market. There has been a slight improvement in St. Louis with an advance of 2½ points as a result of fair business which was done in the latter part of last week. The New York price remains at 4.20c.

Spelter.—A fair amount of activity and sustained prices have characterized the spelter market in the last week. On May 20, 700,000 lb. of August spelter was sold on the floor of the New York Metal Exchange at 6.50c., St. Louis, equivalent to about 6.65c. New York. Prompt shipment from the West is quoted at 6.85c., New York.

Antimony.—A little more strength has developed in the market for antimony, although prices are the same as quoted a week ago for both Cookson's and Hallett's. For the former 8c. is asked and for Hallett's, 7.62½c. Chinese and Hungarian grades are ¼c. higher at 7c.

Chicago

MAY 20.—The past week has witnessed some very heavy buying of copper and the price has advanced materially. Tin prices are temporarily lower, but evidences point to a strong reaction. The demand for old metals has been so light that the rising copper market has failed to influence quotations. We quote as follows: Casting copper, 16.25c.; Lake, 16.50c., in carloads for prompt shipment; small lots, ¼c. to ¾c. higher; pig tin, carloads, 46.75c.; small lots, 48.75c.; lead, desilverized, 4.15c. to 4.20c., for 50-ton lots; corroding, 4.40c. to 4.45c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 6.95c. to 7.05c.; Cookson's antimony, 8.50c., and other grades, 8c., in small lots; sheet zinc is \$8.65 f.o.b. La Salle or Peru, Ill., less 8 per cent. discount, in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots: Copper wire, crucible shapes, 13.75c.; copper bottoms, 12.25c.; copper clips, 13.50c.; red brass, 12c.; yellow brass, 9.75c.; lead pipe, 3.90c.; zinc, 4.75c.; pewter, No. 1, 28.50c.; tinfoil, 33c.; block tin pipe, 43c.

St. Louis

MAY 20.—The metal markets are firm. Tin is steady at 46.90c. Lake copper stands at 16.90c. and electrolytic at 16.77½c. Antimony, Cookson's, is unchanged at 8.35c. Lead is better at 4.12½c., and firm at that figure so far as holders are concerned. Spelter is nominally 6.70c. offered, but not easy to get and deferred deliveries are considerably higher, probably with 7c. as the extreme range. In the Joplin ore district zinc blende brought a top price of \$61 per ton with \$58 as the assay basis for 60 per cent. The prevailing basis, however, was lower than this with a range affected by the location of the mine, quality of the ore, etc., running from \$50 to \$55 with a few lots at \$57 and \$58. The highest settlement was made on a sale of the previous week, which was not shipped out until last week. Calamine brought \$25 to \$28 for 40 per cent., with the choice lots up to \$32. Lead ore was weak at \$50 to \$52. On miscellaneous scrap metals we quote as follows: Light brass, 5c.; heavy brass and light copper, 9c.; heavy copper and copper wire, 10c.; zinc, 3.50c.; lead, 3.50c.; pewter, 21c.; tinfoil, 31c.; tea lead, 3c.

Iron and Industrial Stocks

NEW YORK, May 22, 1912.

The stock market for the past week has not indicated any special tendency. Prices of stocks have moved up or down according to special influences. Those who engineer important movements seem to be awaiting political or other developments. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week has been as follows:

Allis-Chalm., com...	1 - 1½	Pressed Steel, com...	35 - 35½
Allis-Chalm., pref...	3¾ - 4¾	Railway Spring, com...	34½ - 35
Bald. Loco., com...	53¾ - 54	Railway Spring, pref...	100¾
Bald. Loco., pref...	107¾ - 108	Republic, com...	23½ - 24½
Beth. Steel, com...	38 - 39¾	Republic, pref...	78¾ - 80¼
Beth. Steel, pref...	70½ - 72	Sloss, com...	50½ - 52
Can. com...	36¾ - 41½	Sloss, pref...	100
Can. pref...	115¾ - 119¾	Pipe, com...	21 - 22½
Car & Fd'y., com...	58¼ - 60	Pipe, pref...	55½ - 56½
Car & Fd'y., pref...	118 - 118¾	U. S. Steel, com...	68½ - 71¾
Steel Foundries...	38½ - 39¾	U. S. Steel, pref...	110¾ - 111¾
Colorado Fuel...	28¾ - 30	Westinghouse Elec...	73 - 75½
General Electric...	168¾ - 170½	Am. Ship, com...	56
Gr. N. Ore Cert...	41¾ - 45	Chic. Pneu. Tool...	49½ - 51½
Int. Harv., com...	119½ - 124½	Cambria Steel...	43 - 43½
Int. Harv., pref...	117	Lake Sup. Corp...	28¾ - 29½
Int. Pump, com...	30	Warwick...	10½
Int. Pump, pref...	81½	Crucible Steel, com...	12½ - 12¾
Locomotive, com...	41½ - 43½	Crucible Steel, pref...	83½ - 84
Nat. En. & St., com...	17¼ - 19¼	Harb Walk Ref., pref...	99

Dividends Declared

The General Electric Company, regular quarterly, 2 per cent., payable July 15.

The Aluminum Company of America has been charged by the Government, in a suit brought at Pittsburgh, May 16, with violating the Sherman anti-trust act in restraining trade in the United States and abroad in bauxite, crude and semi-finished aluminum and the manufactured products, including both stamped and spun cooking utensils. The company is stated to have accepted a proposed decree which is expected by the Government to open up the aluminum industry, both for the independent makers of crude aluminum and also for the numerous forms of its manufacture, throughout the United States.

Personal

President James A. Farrell, of the United States Steel Corporation, started on Tuesday for a week's tour of the Connellsville coke district. He will inspect the plants of the H. C. Frick Coke Company, a subsidiary.

John Fritz, who is ill at his home in South Bethlehem, Pa., was remembered feelingly at the annual banquet of the American Iron and Steel Institute at the Waldorf-Astoria May 17. At Judge Gary's invitation the guests drank to Mr. Fritz's continued health and happiness, and a telegram was sent to him bearing good wishes and hopes for his recovery.

H. F. Hoevel, vice-president Wiener Machinery Company, 50 Church street, New York, sailed for Europe May 18, for a prolonged business trip.

C. W. Sherman has resigned as general manager of the Pratt & Letchworth Company, Buffalo, N. Y., and on June 1 will go to Hamilton, Ont., where he will organize a steel foundry company.

John R. Russel, secretary and treasurer of the Great Lakes Engineering Works, Detroit, Mich., is in Europe.

Geo. W. Wilson has severed his connection with J. K. Dimmick & Co., Philadelphia, Pa., to accept a similar position with Jas. Pierpoint & Co., Philadelphia, who are in the iron and steel, coal and coke business. Pierpoint & Co. are contemplating opening an office in Pittsburgh, and doing a Lake business this season.

Duncan H. Macdonald has resigned as general manager and superintendent of the Southern Engine & Boiler Works, Jackson, Tenn., and will move to New Bedford, Mass., to take up special engineering work.

C. A. Nourse has resigned as general superintendent of the American-La France Fire Engine Company, Elmira, N. Y., to take a superintendent's position with the Reed-Prentice Company, Worcester, Mass. He assumes his new duties June 1.

Alexander McCulloch, for many years superintendent of the De La Vergne Machine Company, has severed that connection and organized the Mechanics' Tool & Supply Company, which is engaged at 30 Church street, New York, in selling small machine tools, high speed steel and other machine specialties.

A. B. Dunn has been placed in charge of the New York office of the Chisholm & Moore Mfg. Company, Cleveland, Ohio, as manager, succeeding James L. Neefus. The company's New York office is at 30 Church street.

W. S. Chase, sales manager National-Acme Company, Cleveland, Ohio, and Oliver Henn, of the same company, returned May 17 from a three months' tour of England and the Continent, including Sweden and Norway. Mr. Chase said, upon his return, that the general business conditions looked good in every country visited by Mr. Henn and himself and that he had been surprised by the rapidity with which English trade is recovering from the effects of the recent coal strike.

Frank W. Milbourn has been elected general manager and Hugh M. Harris has been appointed superintendent of the Southern Engine & Boiler Works, Jackson, Tenn.

H. W. Kreuzburg, president Champion Tool Works Company, Cincinnati, Ohio, sailed from New York May 23, on the steamer Cincinnati, for an extended business trip through Europe.

Fred A. Geier, president Cincinnati Milling Machine Company, Cincinnati, Ohio, was elected president of the Cincinnati Commercial Association at its annual meeting held May 18.

George T. Robinson has resigned his position as superintendent of mines for the Cambria Steel Company, Johnstown, Pa., effective May 31. He retires to give more time to his own business interests.

C. B. Hopper, Cincinnati sales manager of the National Screw & Tack Company and the Cleveland Bolt & Mfg. Company, has moved his office to 515 Mercantile Library Building.

R. L. Parrish, president Oriskany Ore & Iron Corporation, Lynchburg, Va., sails for Europe this month.

A. T. Waterfall, superintendent Russel Wheel & Foundry Company, Detroit, has been appointed by the Detroit Board of Commerce to the newly created office of traffic commissioner. The officers of the Russel Company have granted Mr. Waterfall a leave of absence for the completion of the work he has undertaken for the shippers of Detroit, involving a thorough investigation of the terminal facilities of the railroads and the measures to be undertaken for their improvement.

Henry Bevan has been appointed general manager of the works of the Western Steel Corporation at Irondale, Wash., by the trustee for the bondholders.

Guy J. Stock, Darlington, England, inventor of the Stock steel converter, is again in this country, and is visiting a number of steel casting plants in the United States and Canada on business in connection with his process.

Lorenzo C. Dilks, contracting manager Eastern Steel Company, 60 Broadway, New York City, left May 19 for a two months' trip, largely for recreation, to the Pacific coast.

Dr. Th. Schuchart, the efficiency expert of the Thyssen interests at Mülheim-Ruhr, sailed May 18 from New York for his home in Germany.

Obituary

THOMAS G. SMITH, in charge of the gray iron foundries of the Midvale Steel Company, Nicetown, Philadelphia, Pa., for a number of years, died May 9 at the Germantown Hospital, after a short illness, aged 56 years. He had been prominently identified with the work of the Foundry Foremen's Association of Philadelphia from its formation, holding various elective offices, and was vice-president at the time of his death. At a special meeting of this association, held May 10, a committee consisting of D. M. Kittinger, John Alexander and C. J. Krayner was appointed to prepare memorial resolutions.

Glass poles for telegraph and telephone work have, according to the Telephone Engineer, shown a reason for existence in their resistance to the ravages of insects in tropical countries and to rain and snow elsewhere. The glass is strengthened by interlacing and intertwining of wire.

The engine house of No. 3 furnace of the E. & G. Brooke Iron Company, Birdsboro, Pa., was damaged by fire May 18. Some injury was done to the machinery, probably amounting to \$20,000. The loss is largely covered by insurance.

Trade Publications

Roller Bearings.—Hyatt Roller Bearing Company, Newark, N. J. Mailing card. Deals with the use of Hyatt flexible roller bearings to secure economical drilling. The advantages claimed for these bearings for machine tool work include increased speed and output, elimination of overheated bearings, a reduced power consumption and a minimum oiling expense.

Pumps.—Goulds Mfg. Company, Seneca Falls, N. Y. Three bulletins. No. 107 deals with a line of deep well triplex pumps which are illustrated and briefly described. No. 108 pertains to a line of deep well working heads for operating both single and double-acting deep well cylinders in wells ranging from 150 to 500 ft. in depth. The various heads are illustrated with condensed specifications on the facing pages. No. 109 describes and illustrates pumps for special services for use in connection with hydraulic machinery, oil pumping and handling chemicals and semi-fluid material. In general arrangement this bulletin corresponds with the other two, illustrations and specifications of the various pumps being included.

Electric Welding Machines.—Thomson Electric Welding Company, Lynn, Mass. Pamphlet. Concerned with a line of electric welders for handling a wide range and variety of work. The different machines are illustrated and samples of the work turned out by them are shown. Among the machines described is the new butt welder which was illustrated in *The Iron Age* August 10, 1911.

Pittsburgh and Vicinity Business Notes

The Vulcan Crucible Steel Company, Aliquippa, Pa., manufacturer of high grade crucible and acid open-hearth steel, has installed and is now operating a modern 14-in. mill, designed and built for the company by the Lewis Foundry & Machine Company, Pittsburgh. This mill occupies a new 350-ft. extension to the old mill building. The Vulcan Company now has two complete mills, 10 and 14 in., and is contemplating the installation of an electrical drive for them. On account of its steadily growing business in tool steel, it will increase its annealing capacity in the near future.

The Pittsburgh Valve, Foundry & Construction Company, Pittsburgh, Pa., has completed the contract for piping the by-product coke plant at South Bethlehem, Pa., for the Didier-March Company, under conditions which are particularly gratifying to both interests. Under a penalty contract with a promise of seven weeks to pipe three boilers, one large turbine and all auxiliaries, the work was completed on the exact date. Under a penalty contract calling for 10 weeks' delivery for the complete erection on the whole plant, the job was finished in nine weeks. The work included cast steel valves and fittings and welded header with both Atwood line welds and interlocking necks. The contract also called for the highest class of workmanship and material.

The L. A. Green Equipment Company, dealer in rails, machinery and supplies for mills, mines and contractors, is now settled in its new location, 3145 Penn avenue, Pittsburgh.

The Pittsburgh Screw & Bolt Company, which recently bought the North Side works of the Riter-Conley Mfg. Company, is preparing to remodel the buildings, expecting to occupy them in the fall. A good deal of new equipment will be installed. The company will about double its capacity for the manufacture of nuts and bolts of all kinds.

The Standard Sheet Metal Company, now operating a plant on the North Side, Pittsburgh, has bought about 2½ acres of ground at Washington, Pa., where it will erect a larger and more modern plant.

John C. Bole, an iron and steel broker of Pittsburgh, has filed a petition in bankruptcy in the United States District Court. His liabilities are given as \$119,401 and assets as \$420.

Samuel W. Hay's Sons, manufacturers' representatives, Keenan Building, Pittsburgh, Pa., desire to receive catalogues and prices from manufacturers of foundry equipment and supplies, power plant specialties, mill equipment and machine tools.

A first mortgage by the Phillips Sheet & Tin Plate Company on its plants at Clarksburg and Weirton, W. Va., has been filed for record, the mortgage being made to the Fidelity Title & Trust Company, Pittsburgh. It is to cover a \$2,000,000 bond issue, and is to run until February, 1922.

The Standard Chain Company, Bailey-Farrell Building, Pittsburgh, will make some large extensions to its plant at Marion, Ind.

Officials of the Youngstown Sheet & Tube Company, the Carnegie Steel Company and the Republic Rubber Company having invited the members of the Engineers' Society of Western Pennsylvania at Pittsburgh to inspect their plants in and near Youngstown, the visit was made Saturday, May 18. The party went first to the rod and wire mills of the Youngstown Sheet & Tube Company at Struthers; next to the plant of the same company at Youngstown, and finished the visit by going through the Ohio works of the Carnegie Steel Company in the afternoon. It was one of the most interesting inspection trips ever made by the society. About 200 members were in the party.

The Wellman-Seaver-Morgan Company, Cleveland, Ohio, has taken a contract for a large coal handling plant to be erected for the Norfolk & Western Railway at Norfolk, Va. The plant will include a double car dumper, elevators, and other equipment.

The Clinton furnace, Pittsburgh, which has been idle for some time, is expected to blow in this week.

Customs Decisions

Galvanized Date Nails

The Board of United States General Appraisers has overruled a protest filed by Byrnes & Dowery claiming galvanized date nails to be dutiable as malleable iron castings under the tariff act of 1909. The Government alleged that the merchandise should be classified as "manufactures of metal not specially provided for" at the rate of 45 per cent., whereas under the importers' contention the duty would be 7/10 cent per lb. The nails are of iron, galvanized or plated with zinc, and have a broad, flat head on which a date is cast. They are used by railroad, telegraph and telephone companies to give the date of the placing of poles, ties, etc.

The date nails, which are of cast iron, are made malleable by subjecting them to a continued red heat and thereafter allowing them to cool slowly. They have subsequently been galvanized or covered with zinc, and for this reason Judge Fischer holds that the galvanizing process has advanced the goods beyond the condition of castings. The decision says that the term "castings" as used in tariff acts has uniformly been construed as being limited to such articles of metal as have not been manipulated or advanced by labor bestowed subsequently to the process of casting, unless such labor constitutes a mere process incidental to the general foundry work. The collector's assessment at the higher rate is approved.

Steel Forgings

The board has reversed the Government's assessment on steel forgings imported by the Coe Brass Mfg. Company. The tribunal found that the forgings had not been further advanced than "rough turned or rough machined," and, therefore, sustained the protest claiming them dutiable at 35 per cent. under paragraph 127 of the 1897 tariff act. The collector had assessed the forgings at 45 per cent. under paragraph 193 as "articles of steel partly or wholly manufactured."

The Berkshire Iron Works, Sheridan, Pa., is considering the construction of a concentration plant, which, if arrangements are completed, will be installed by the American Grondal Company, 45 Wall street, New York. The Metropolitan Electric Company, Reading, Pa., is figuring on the question of delivery of power for the operation of this plant, which would involve the extension of its transmission line from Wernersville to Sheridan.

Reports in daily papers that Nittany and Bellefonte furnaces, Bellefonte, Pa., will shortly blow in appear to be without foundation. Shipments against orders are being made from stocks, comprising some 6000 tons, but the blowing in of the furnaces, which have been idle for several years, is dependent on the selling price of pig iron. The present level is considered too low for profitable operation.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has definitely decided to build, at Youngstown, a fourth blast furnace, which will be an exact duplicate of the present three furnaces. It will be 88 ft. in height and 22 ft. in diameter, and will have a daily capacity of about 500 tons. The company is building a large open-hearth steel plant and will need additional iron when it is completed.

The Chicago Foundrymen's Club has issued an attractive prospectus and invitation for its annual reunion, which covers a visit to the Gary plant of the Indiana Steel Company on May 25, to be followed by a banquet at the Auditorium Hotel in the evening. The trip to Gary will be made on the steamer City of Chicago, which leaves at 11:00 a. m. Requests for accommodations should be made to C. E. Hoyt, secretary, Lewis Institute, Chicago.

The Bureau of Labor of the Department of Commerce and Labor, in its Bulletin No. 97, for November, 1911, just at hand, presents copies of laws of various States relating to labor enacted since January 1, 1911. The volume comprises 638 pages. An introduction by Lindley D. Clark gives an exhaustive review of the labor legislation of 1911.

The National Machine Tool Builders

The Spring Convention at Atlantic City—The Transactions Include Matters of Interest and Importance—Standardization, Nomenclature, Future Association Work

The National Machine Tool Builders' Association held its semi-annual convention at the Chalfonte Hotel, Atlantic City, N. J., Thursday and Friday, May 16 and 17. While the representation of the industry was smaller than that of the annual meeting at New York, nevertheless it was a large gathering. Gloomy, rainy weather interfered to a certain extent with the leisure hours of the opening day, but Friday was delightful, and odd hours were greatly enjoyed by the members and wives, of whom not a few were in attendance and took full advantage of the occasion. The addresses were of interest and some business of importance was transacted.

Officers' Reports

President E. P. Bullard, Jr., welcomed the members and referred to the importance to the association of the six months which have elapsed since the annual meeting, especially in the carrying out of the association's vote to employ a permanent secretary. As the constitution calls for a secretary who shall be a member of the association, the executive board has decided to give to James H. Herron, Cleveland, Ohio, the title of general manager. President Bullard emphasized the established high standing and influence of the association, representing as it does 90 per cent. of the machine tool production of the country, a proportion which is constantly changing through increasing membership. The strength and value of the organization were demonstrated in combatting the recent attempt to put machine tools on the free list.

Secretary Charles E. Hildreth had no report to make, but President Bullard spoke in terms of highest praise of the value of Mr. Hildreth's labors during the year, especially to his aggressive enterprise in the preparation for presenting the machine tool builders' case in connection with the tariff legislation.

The report of Albert E. Newton as treasurer indicated a prosperous half year.

The president announced these committees:

Auditing—E. J. Fullam, Fellows Gear Shaper Company, Springfield, Vt., chairman; P. G. March, Cincinnati Shaper Company; Winslow Blanchard, Blanchard Machine Company, Cambridge, Mass.

Resolutions—W. A. Viall, Brown & Sharpe Mfg. Company, Providence, R. I., chairman; E. C. Henn, National Acme Mfg. Company, Cleveland, Ohio; C. A. Johnson, Gisholt Machine Company, Madison, Wis.

Membership Matters

New members were admitted as follows:

A. D. Quint, Hartford, Conn.
Landis Machine Company, Waynesboro, Pa.
The Hisey-Wolf Machine Company, Cincinnati, Ohio.
The Grant Mfg. & Machine Company, Bridgeport, Conn.
The Geometric Tool Company, New Haven, Conn.
Gooley & Edland, Syracuse, N. Y.
Joseph T. Ryerson & Son, Chicago, Ill.
Acme Machinery Company, Cleveland, Ohio.
Langelier Mfg. Company, Providence, R. I.
Baird Machine Company, Bridgeport, Conn.
Armstrong-Blum Mfg. Company, Chicago.

Changes in names of membership were made as follows:

Treadwell Engineering Company, to replace the Stoeber Foundry & Machine Company, Easton, Pa.
Flanders, Mfg. Company, to replace the Grant & Wood Mfg. Company, Pontiac, Mich.
Conover-Overkamp Machine & Tool Company, to replace the Miami Valley Machine Company, Dayton, Ohio.
Reed-Prentice Company, to replace the F. E. Reed Company and Prentice Bros. Company, Worcester, Mass.
Jones & Lamson Machine Company, to replace the Fay Machine Company, Springfield, Vt.

A Report on Standardization

Daniel M. Wright, Henry & Wright Mfg. Company, Hartford, Conn., made a report as chairman of the Committee on Standardization, in which he said, in part:

If the general idea of standardization as applied to the machinery constructing business may be made to serve a very beneficial purpose, the matter is too big and broad and important to be considered hastily and should rather be approached by such easy stages that there will be the least possible chance of either error, omission or misunderstanding of any sort in the minds of those most clearly interested. Each suggestion of standardization should be carefully weighed, tried and debated upon with the idea that when our association is asked to give its seal of approval it would convey with it the weight and respect that would be absolutely necessary to make the adoption of a standard universally successful.

Also the makers of each class of machine should be represented on a standardization commission and any ideas which may appear from time to time should be thoroughly threshed out by the makers of the machines most vitally affected before a resolution of adoption is handed to the commission for approval.

Also the matter is weighty enough and has future importance enough so that any resolution of standardization which may be thought worthy of approval should be placed on probation for a period of about six months, or between the dates of our semi-annual meetings, in order to give all the members of the association every reasonable opportunity to offer additions, subtractions or objections or criticism of any sort to the contemplated resolution prior to its final adoption.

Standardization has proved of incalculable benefit as already applied to various departments of the mechanical engineering profession, and possibly a commission of the character suggested might make very material headway along similar lines, but the interests affected are of such a varied character, and a hasty change might in some cases mean such a one-sided expense to some as against actual profit to others that unless the matter is handled in the most careful manner it will quickly lead to dissension and disorganization, and fail absolutely to accomplish its aim. Practically all recent writers on the subject seem to agree on this point.

MACHINE NAMES

For nearly four years a persistent effort has been made to standardize machine names, and it is perhaps significant, as bearing on the importance of approaching general standardization with care, to note that greater headway has been made in the matter of standardizing machine names in the past six months than in the years previous. It has taken that long for the matter to sink in deep enough to take lasting effect. But while it is perhaps gratifying to those interested to know that a large number of the makers of metal-working machinery are at last giving the matter serious consideration, as evidenced by the rapidly changing wording of advertisements, catalogues and the indexes and editorials of the mechanical magazines, how much more rapid would have been the progress had the idea been broached with the seal of approval of our association.

Almost all recent writers on the subject have made suggestions of various forms of standardization, and it does not take very much thought to bring many things to mind that might be standardized to possible benefit and profit to our industry, but while the increasing discussion shows the growing interest in the subject very little practical advance is being made or can be made until more concerted and intelligent effort is put into the work.

If the idea of a gradually growing plan of standardization is of no practical account it should be abandoned without further waste of time or effort, and, if it is, it should be handled in a way to give the greatest possible benefit and the least expense to our members. [Mr. Wright recommended a resolution which was adopted later in the session.]

TO CHANGE ASSOCIATION NAME

If the first work in the direction of standardization is an effort to arrive as nearly as possible to correct practice as a base, it might be well to make a start by correcting the name of our association. Inasmuch as there seems to

be no resemblance between the definition of a tool and a machine, they should never be confused, and we are, therefore, an association of machine constructors instead of tool makers, and as our machinery is mostly used to work metal and our association has its home in America it may very properly be called "The American Metal Working Machinery Constructors' Association," and not merely correct its title, but do away with the uncertainty which exists in the minds of many of our members as to who is eligible to membership, and very largely increase the scope of its work by taking in concerns who manufacture any kind of a machine for working metal.

In support of this situation it might be well to consider that the courts have ruled that any machine that employs a tool in its work is just as much entitled to the name "machine tool" as any other machine, and under this ruling, if accepted literally, even makers of mowing machines or sewing machines, or any machine except engines, which employ no tools in their work, may very properly be entitled to consider themselves eligible to our membership, whereas the change of name to "The American Metal Working Machinery Constructors' Association" would clearly define our membership and would prove a very important start and help to a standardization committee and to our membership committee.

In further support of the idea of correcting the name of our association, it may be well to call attention to the very great confusion which exists in the minds of the customs authorities as to what constitutes a so-called machine tool, and to the further confusion in the minds of our members as shown in reports of court proceedings from time to time and to the difficulty in properly translating the term in the foreign languages which appear in our increasing foreign transactions. But possibly the most sensible reasons that may be urged in support of the change is that it is more nearly correct, it clearly and briefly defines the limits of membership, it in no way interferes with the work of the committees of our association, and the comparatively few additional members which it might admit would bring all good and no detriment to our work.

There has been some objection to the change of the name of our association on the ground that it would admit many new members and might make our association unwieldy. In defense of that objection I would point out that if the interpretation of the courts is to be accepted literally we would be restricting the limits of our membership rather than otherwise; also that our association differs from many others in that it is divided into committees composed of the makers of each type of machine, and practically all the business of especial interest to the makers of any particular machine is done in the committee meetings of the makers of the machine in question, and all business which is conducted on the floor of our conventions is invariably on matters of general interest and the slight additional membership which might come to the association would be beneficial rather than otherwise; and a great many of the concerns outside of our present association, on account of the fact that they have not as yet made a machine coming under the vague definition of a "machine tool," are rapidly becoming members, or will become members in the near future, for the reason that they are making some small machine in connection with their other machinery which would entitle them to membership under our segregated list.

When a resolution proposing the change in name was submitted to the association by the Resolutions Committee the convention voted to submit the question to a letter ballot of the members.

C. Wood Walter, chairman of the committee on the matter of prices to be charged educational institutions, discussed briefly the several phases of the subject.

In the absence of Fred A. Geier Mr. Walter made an informal report of the fight against placing machine tools on the free list before the Senate committee, and told in interesting detail the present status of the movement.

Before adjournment the meeting went into executive session, which was given over to a "heart to heart talk." Thursday afternoon Fred E. Rogers, editor of *Machinery*, read an interesting paper on "How Can the Mechanical Journals Be Made of the Most Value to Their Patrons?"

James H. Herron, the general manager of the association, made an address on "What Can the Association Do for Its Members?" He said in part:

General Manager's Report

There now seems an immediate need of active work on the part of a Committee on Nomenclature. There is a wide diversity of opinion relative to "what is what." This condition should not exist longer than is possible; it is altogether unnecessary and leads to much confusion. This matter should be worked out thoroughly in the committee and submitted to the membership by letter ballot.

Under this class we might possibly consider the sizes of tools, and what such sizes indicate. In my own experience as a salesman of machinery, when I offered a prospective purchaser a certain size lathe, the question invariably came up, "What will it swing over the carriage?" and "What will it take between centers?" If the sizes of lathes could be determined by their actual capacity, and not upon some nominal rating, it would simplify the work of the machinery salesman. It would assist the buyer and enable him to make a better comparison when purchasing machine tools. It is true that this has been done in certain machine tools; their ranges have been standardized. But why not carry this same thing to all machine tools and simplify the whole matter? It is manifestly one of the functions of this association to accomplish this, and put the American machine tool industry on such a basis, as a whole, that the man buying the machine tools can readily compare tools of a similar kind without a long and laborious tabulation.

Much has been said on this subject and some effort has been made to accomplish it in certain lines. But has enough been done to standardize the simpler things? Mr. Alford, of the American Machinists, in his excellent paper before the last convention, spoke of standard T slots for different size bolts. While this may seem a simple matter, it is nevertheless of considerable importance. One of my own recollections of the machine shop was my inability to find the right bolt for a certain T slot, and much time was lost in looking around and frequently a new one had to be made. This resulted in lack of efficiency, which of course is contrary to the more advanced thought of the day.

There are many other apparently unimportant details of machine tools that could be similarly standardized, and if a movement were inaugurated at once to determine standards for these simpler things, would it not be conducive not only to the welfare of the user, but lessen the cost of manufacture in the plants of the members of this association? As a rule, these minor matters are turned over to some draftsman, who makes it according to his idea. When we get the numerous ideas of the numerous draftsmen there is certainly a confusion which leads to much unnecessary equipment in the way of small tools, jigs and fixtures in the plant of the user.

All such standards developed under the auspices of this association could be known as the National Machine Tool Builders' Association Standards. Eventually this might be extended to include some of the more important parts of machine tools, and possibly some material entering into these parts, whereby the manufacturer who is a member of this association could buy much material as a standard article, and not be compelled to take almost any old thing that in many cases is given to him.

The standardization of parts need not in any way limit the ingenuity of the designer. It will as a matter of fact tend to make him more useful to his employer, giving him a list of well-designed standards that he can follow implicitly and relieve him of much thought that otherwise would be given to details.

STANDARDIZATION NOW IN EFFECT

The Society of Automobile Engineers has set us an example in this respect. All minor parts and things entering into an automobile are being standardized, so that the cost of material will be much less. There is one item that shows what this has accomplished, namely, in tubing between $\frac{1}{2}$ in. and $2\frac{1}{2}$ in. it was found that there were something over 2000 different sizes and gauges in use by the automobile manufacturers. This has been reduced to 50, which all the tube makers have declared is not a hardship to carry in stock, and which can be procured at a much less cost than formerly.

There is no need that the use of such standards be revolutionary. They would be incorporated in new designs when they were gotten out. This would not entail any cost on the part of the machine tool builders in adopting these standards.

It is desirable that the subject of safety be considered as soon as possible. It is only a question of time before all manufacturers will be compelled to provide all of their products with such safety appliances as the safety of the workingman may require. In the new laws already enacted the burden of accidents will come upon the employer of labor, and he will insist that the tools and other appliances going into his plant will have all parts properly safeguarded to prevent possible accidents. Why not anticipate these needs and at the same time put all machine tool builders on the same competitive basis to furnish certain guards on parts of their machines so that no hardship will be worked upon any one manufacturer? Many are now doing this, but others are reluctant to undertake it. As some have not done it, they consider that by offering their machines in competition to similar machines of other manufacture, where this is not taken care of, they are working a hardship upon themselves and one which

they cannot afford. There is much ground for such argument, but if all manufacturers were disposed to protect their machines in like manner this condition would be entirely eliminated; the purchaser would be getting what he paid for, the operative would be protected and the laws of all states complied with.

If there is not already a committee appointed to formulate plans, with sub-committees representing different classes of machine tools, it would seem that it behooves this association to do something of a positive and definite nature to meet this need. This will benefit the association inasmuch that it will be recognized as a leader in such a movement, and it will benefit the members in that it will put them upon a fair competitive basis, and the whole move will be one of general improvement.

THE VALUE OF STATISTICS

There are many valuable statistics that this association should have relative to the extent and development of the machine tool industry both here and abroad. The former should be compiled from the membership of this association. It should also include the exports of machine tools by countries. This could be compiled monthly or yearly, whichever seemed preferable.

This matter was brought to my mind very forcibly when in Washington a short time since. In an endeavor to get some data on the growth of the American machine tool industry from the Department of Commerce and Labor one of the assistant directors kindly suggested to me that I might be able to get the data that I desired from the National Machine Tool Builders' Association. This would indicate clearly the logical place to obtain such information. If such information had been compiled and been available at the time the preparations were made for the hearing before the Senate committee on the Underwood tariff measure much labor would have been saved.

I think that a hearty co-operation on the part of all members of this association in this respect would not in any way violate the best business principles, and any detailed and confidential information furnished the association would at no time be known outside of the secretary's office. Such information would be promptly returned to the senders upon its use as a part of the general summary. This general summary would then be available for any use which the association might deem advisable.

INDEX OF TECHNICAL ARTICLES

Many of the members of the association at times have problems that they prefer to have their own engineering force develop, but there seems to be a lack of information of a reliable character to draw from. The technical press is constantly publishing articles that would be of interest to our members, and in my experience I have found that comparatively few concerns keep an index of articles that interest them particularly. Generally no one is delegated to read the articles, pass upon them and index them in any form that might render them available at any time. Why cannot this association maintain an index of all technical articles upon such subjects that might be of interest to its membership? Such an index would be a very valuable addition to the association's work. The members individually would feel that they have a source of information of a reliable character and available for immediate use. This would, of course, necessitate the perusal of a large number of technical papers weekly and monthly, but I believe that this could be done and such an index maintained in the secretary's office. It is said "That education is not in actually possessing definite information on the subject in question, but to know where to look for such information when it is needed."

While the association has done good work upon the subject of cost keeping, and the general system that has been issued is excellent, there may be needs of the individual members of this association that would require some modification of this system. Would it not be the function of this association to assist such members in devising some modifications of the authorized system to meet their specific need? This will tend to eliminate much misconception as to what constitutes cost, and will lead to a better understanding on the part of the members.

The whole consideration of this subject, after all, comes down ultimately to "What will the members themselves do for the association?"

Addresses and Reports

Secretary Charles E. Hildreth made an important address, illustrated by an elaborate chart, on the subject, "What Has the Future in Store for Us?" which is printed elsewhere in this issue.

L. P. Alford, editor of the American Machinist, made a report for the Advisory Committee on Cutting Tools, of the National Bureau of Standards. Upon Mr. Alford's recommendation the committee was continued and a vote of

thanks and appreciation was extended to Dr. S. W. Stratton, the director of the bureau.

General Business

Mr. Herron, for A. T. Barnes, chairman of the committee on the admittance of manufacturers of woodworking machinery to the association, reported a letter ballot of the members as opposed to the proposition, and offered a resolution, which was accepted, that the association confine its membership to those manufacturers who make machines and tools and who have interests in common, such as methods in general, of manufacture, similar problems relating to costs and selling, tariff matters, etc.

Charles E. Carpenter, general manager of E. F. Houghton & Co., Philadelphia, made an address on "The Value of a House Organ as an Advertising Medium."

President Bullard appointed W. A. Viall, Brown & Sharpe Mfg. Company, Providence, R. I., and C. A. Johnson, Gisholt Machine Company, Madison, Wis., as the Committee on Foreign Relations.

The new Programme Committee consists of S. H. Reck, Rockford Drilling Machine Company, Rockford, Ill.; Charles L. Taylor, Taylor & Fenn Company, Hartford, Conn.; Winslow Blanchard, Blanchard Machine Company, Cambridge, Mass.

The Membership Committee is made up of Charles E. Hildreth, Whitcomb-Blaisdell Machine Tool Company, Worcester, Mass.; Daniel N. Wright, Henry & Wright Mfg. Company, Hartford, Conn.; G. A. Yost, Lucas Machine Company, Cleveland, Ohio.

The Resolutions

On recommendation of the Committee on Resolutions, of which W. A. Viall was spokesman, the following resolutions were adopted:

Whereas, Standardization has proved of incalculable value to various branches of mechanical engineering, and we conceive it desirable that this association should work toward the fullest application of this principle in our industry, now therefore, be it

Resolved, That a permanent Standardization Commission be established in this association, to receive or formulate, consider and after investigation recommend proposals looking toward standardization of all matters affecting the metal working machinery industry, and further,

Resolved, That such Standardization Commission be composed of one member from each of the regular committees of makers of the various machines constructed by our members, to be elected and serve until their successors are chosen, and also

Resolved, That the manager of our association shall be the executive secretary of such Standardization Commission, and further,

Resolved, That any proposal for standardization that receives the approval of a two-third majority of such commission shall be thereafter printed and sent to each of our members; but no final action by the association looking to the adoption of the same shall be taken within less than six months from its original submission, and when acted upon shall be either adopted or rejected as recommended by the commission without amendment, or referred back to the commission if amendment is desired for such amendment and re-submission as before, and when finally adopted by the association shall be officially certified to each member, and a permanent record shall be kept in the office of the association of all such standards adopted; further,

Resolved, That it shall be the duty of this Standardization Commission to co-operate so far as possible with other engineering societies, such as the American Society of Mechanical Engineers, for the purpose of interchanging ideas and proposals with reference to standardization.

A resolution was enthusiastically adopted twice, the only difference being in its address to Fred A. Geier and C. Wood Walter, and was presented to these gentlemen, handsomely engrossed and framed. Its text follows:

The passage of the Underwood tariff measure, H. R. 18,642, by the House of Representatives on January 29, 1912, came with little warning to our association. Immediate action was necessary to prevent a similar occurrence in the Senate. The situation was one fraught with serious consequences to the machine tool trade of America.

That we had among us a man equal to the emergency was fortunate, and we desire to extend to our ex-president, Fred A. Geier, our appreciation of his efforts in our behalf.

Whereas, At serious inconvenience to himself, both at home and in business, he assumed direction of a most vigorous and thorough defense of the interests of American machine tool builders, therefore, be it

Resolved, That the National Machine Tool Builders' Association extend to him its sincere thanks for the able preparation and presentation of its case before the Finance Committee of the Senate, February 13 and 14, 1912, and be it further

What the Future Has in Store for Us*

A Study of Ups and Downs in Pig Iron Prices and Machine Tool Sales

BY CHARLES E. HILDRETH†

In endeavoring to get together some data from which something might be gleaned from the experience of the past, I hit upon a rather interesting work, although perhaps disappointing for us, at this time, if there is anything in the saying that "history repeats itself."

Explanation of the Chart Shown

This chart, to which I would ask your attention for a few minutes, is one originated by Samuel Benner, an Ohio farmer. I do not regard it as pointing to any sure results for, at various points in its course, you will perceive that actual facts do not coincide with a certain seeming repetition of cycles and I hope to relieve you of any undue apprehension, before I am through, that its seeming depressing ending has not many bright and redeeming features.

The pig iron statistics I cannot absolutely vouch for, but I have obtained them from as reliable sources as I could find. The machine business line would have been far more definite and reliable had you honored me with your confidence last winter. Having no considerable number to draw from, I have given the line of the three I did obtain, separately, instead of projecting one average line as I then proposed, not, however, at that time, knowing that I was to have this prophetic task thrust upon me.

The chart represents data on pig iron from 1827 to 1912, a period of 85 years, from the best sources I could find up to the present and foretelling the next six years by means of the cycles worked out therein. The business line begins at 1884 and only extends to the present year, as I am not going to attempt to say actually what is in store for us, which is beyond the ken of any mortal. We can only see what has been, together with the conditions which surround us, and hope for the best.

Course of Prices from 1812 to 1844

A report of the Secretary of the Treasury for 1863, the only source of average prices since the war of 1812, shows that 1825, 1826 and 1827 were years of very high prices; that they then declined to their lowest in 1834, and that in 1836 there was a material rise which advanced to its highest of \$70 per ton for Scotch pig in 1837. Panic in money was caused by the suspension of specie payments in May, 1837, yet pig iron had commenced to decline, in March of that year, two months before the panic. During the years 1838, 1839, 1840, 1841 and 1842 the price continued to decline, and 1843 was a remarkable year for extreme depression in all staple articles. Scotch pig was quoted in September of that year as low as \$22.50 per ton, six years after the high prices of 1837. In 1844 prices commenced to advance and in May, 1845, it was \$52.50, or \$30 a ton higher. This maximum was reached in a little less than two years from the low prices quoted in 1843.

Course of Prices from 1844 to 1877

Yearly average prices in Philadelphia for No. 1 anthracite foundry pig from 1844 to 1874, compiled by the American Iron and Steel Association, show that from high prices in 1845 it declined during the years 1846-47-48-49 to 1850, when it reached an average price of \$20.87 per ton, or a period of five years. Our war with Mexico in 1846-47-48 and the influx of gold from California did not have any effect of retarding the decline, as it continued through it all and when peace was declared, after 1850, prices again advanced in 1851-52-53 until in 1854 the high average of \$36 per ton was reached, or four years from 1850.

Prices then began a long decline to the year 1861, when certain hot blast charcoal pig iron was selling as low as \$13 per ton during the winter of 1860-61 in the city of Cincinnati. This period of seven years was one of the most disastrous to the iron trade and prostrated more furnaces than any previous period of declines in the history

of the country. The commercial reaction and financial difficulties of 1857 paralyzed all industries, and in 1860 the banks of Baltimore, Philadelphia, Richmond and other Southern cities suspended and then in the spring of 1861 the War of the Rebellion came as a final blow.

Now, although conditions were almost identical with those of the Mexican War of 1846-47-48, prices began to go up until they reached the high average of nearly \$60 per ton in 1864. Then takes place a six-year decline to 1870, although the averages do not run so low as they did from 1854 to 1861. Again the price advances and, in scarcely two years, in 1872 reaches an average of \$48 per ton, then declines for five years to \$19 in 1877.

Course of Prices from 1877 to 1912

The secretary of the American Iron and Steel Association says, in his report made in 1883:

In our last annual report, issued in June, 1882, the fact was noted that the extraordinary activity in our iron and steel industries which had commenced in 1879 had culminated early in 1882, when the wants of consumers became less urgent and prices generally began to decline. This reaction was not sudden nor violent, but was indeed so gradual that it not only for some time created no apprehension of impending stringency but was actually imperceptible to many manufacturers whose books still continued to receive liberal orders at satisfactory prices. . . . At the beginning of December, 1881, the average price of steel rails at the mills was \$60 per ton, but in December, 1882, the average price was only \$39.

The lowest price for pig iron was reached a few months later and continued through the Presidential year 1884, with a little revival in 1885 and renewed depression in 1886 and 1887, while in 1888, the year Benjamin Harrison was elected, all business was prostrated, bank failures were numerous and stocks reached their lowest point. Then opened up a great speculative era. Iron advanced and business boomed until we reached a climax in a panic the latter part of 1890, although the price of pig had already begun its decline in the middle of that year. Then followed the years of declining prices, 1892-93-94-95-96-97.

You note the business line continues upward, which was due to outside influence in the shape of our immense foreign trade, but when we reach 1898 and iron starts up you notice the business line advanced very sharply through that and 1899, both boom years; this, also, in spite of our war with Spain. Although iron now began its downward trend, business held fairly good through 1901-02-03, even seeming to stimulate iron in 1902 through the enormous excessive demand which quickly reacted and business and iron both reached their low point in 1904. Then started the grand rush in 1905, through 1906 and into 1907 when no one anticipated anything but a continuance. The pace was evidently too rapid, and we experienced an untimely break in the panic of 1907 so that 1908, which should have culminated this period, was a sad commentary on the excessive enthusiasm of the American people to crowd a good thing to a finish. Iron, you note, now begins to turn steadily downward to the present time, although business fluctuates as though uncertain how to proceed. The periods of rise follow very closely in cycles of 3-2-4; the periods of decline in cycles of 7-6-5, and the periods from high point to high point in cycle periods of 8-9-10.

The Influence of Tariff Changes on Prices

In view of the impending reduction of duties, on the part of our Democratic brethren, it is rather interesting to note its effect in the past. You will notice that during the low tariff periods of Van Buren, Polk, Pierce, Buchanan and Cleveland the business of the country was on the toboggan, if the pig iron line indicates conditions, and we have an illustration in the last period showing the rapid decline of business in conjunction with iron during Cleveland's first administration. It is not difficult to realize, without these illustrations, that if the Underwood bill should be enacted, together with drastic reductions in the

*Read before the National Machine Tool Builders' Association, Atlantic City, N. J., May 16.

†General secretary, National Machine Tool Builders' Association, Worcester, Mass.

tariff in other industries, by a victorious Democratic party, its principal supporters, the working people, would witness three years more of unsatisfactory business and unsteady employment undoubtedly to the end of this seven-year period of decline, shown in the chart. It would surely be little enough time for business to readjust itself to new conditions before we could expect to realize the improvement, according to these cycles, due in 1916.

This coming election, with its attendant dangers of tariff tinkering and progressive socialism, is the most depressing part of the situation as I see it, but, before trying to show you some of the bright aspects, I think a little study of the chart will prove interesting.

Note, first, the periods in which the majority of our Presidents have been elected and see if we can then truly say that a year of a Presidential election must, of necessity, be a poor business year because of that fact alone. All but those of Van Buren, Polk and Pierce were held during periods of declining iron and therefore of business reaction. When they came at the end of these periods, as in the case of Harrison's administration and Roosevelt's second term, business revived almost immediately thereafter.

The Great Panics

The great panics of this country during the period covered by this chart were: In 1831, due to a culmination of easy credits at the banks; then, in the period from 1837 to 1839, a great financial crisis, when interest rose to 20 per cent. and discounts to 25 per cent.; in 1848 another short financial panic, but in 1857 a world-wide commercial and financial panic. Next comes the panic of 1873, following the tremendous railroad building and expansion of 1871 and 1872 which resulted in the Jay Cooke failure and that of many banks. The country had hardly recovered from this when there began that gigantic railroad speculation from 1876 to 1879. This unprecedented demand seems to have pushed pig iron out of its normal line, but it almost immediately resisted this unnatural strain, and although stocks held up and went to their highest in 1881 our pig iron barometer began its telltale descent, foretelling the next crisis, which came in the panic of 1884.

Business, you can see, followed this decline exactly, and then fluctuated to the boom years of 1889 and 1890 and undoubtedly would have completed this cycle period but for outside influences in the nature of the silver question debates and the passage of the McKinley tariff bill in October, when our boom ended in a panic. The next downward period was relieved by the bicycle boom in 1895. Then came the good business years of 1898-99 and a part of 1900, then depressed a trifle in 1901, but pushing on to 1902 when labor took a hand and by fomenting trouble started the slide that landed so many in the pit in 1904. Then began the period of advancing business that all of us thought was going to last at least four years, but which was cut off in the middle of the third by the great panic of 1907 and the following distressing year of 1908.

The Signs of the Present Time

Now the question is: Are we nearing the end of this depression or only half way through? Well, let us look at a few signs of the times. You note in the diagram at the top of the chart that in 1908 iron began to tumble in March; in 1909 in February; in 1910 after a brief rise, due to the automobile business, it fell again in February and again in 1911 in May, but that this year it began for the first time in five years to advance first in March and again in May. This would seem to be a good sign, for you will note that in the years 1886, 1895 and 1901, all downward periods, its rise at the first of the year was followed by substantial business.

Of one thing I am convinced. All business is absolutely based on the irrevocable law of supply and demand; whether this can ever be charted out in regular ever-recurring periods I am not so sure. I also know that conditions may at times hasten a boom or a panic; at others may delay either, but business will always rise and fall by reason of the well-known provisions of this law. Now, what is the meaning of this law? You all know that demand means solely the demand of the people; they, and they alone, make this demand; it has no other source. What is it they demand? Food, clothing, all necessities and finally all luxuries. Now these cover all the things that we have and the people's demand for them is what makes business to supply them. When they are over-

supplied, business falls off; when the supply gets low, business advances. In one way we have the most stable business known, for there is not a thing the people wear, eat or have as a luxury that is not dependable for its existence on the machines we make. This being so, let us see if the people of this country are being properly supplied.

From the United States statistics the population of this country increased 20 per cent. from 1890 to 1900 and 21 per cent. from 1900 to 1910. From these same statistics the amount of agricultural implements produced in 1900, compared with our population, showed \$1.33 per person; the same in 1905, and practically the same in 1910, showing that this industry had produced an increasing amount each year proportionally to the population to properly feed each person.

Population and Business

Manufacturers of electrical apparatus have shown that they were providing for the increasing demands in this direction, for figured in the same way their statistics show \$1.39 per capita in 1900, \$1.90 in 1905 and \$2.65 in 1910. When we come to the railroads, however, we find a different state of affairs. In 1890 they put in new equipment \$1.19 per capita; in 1905, \$1.33, an increase of 13 per cent., while in 1910 only \$1.34, or an increase of only 1 per cent. during this five-year period.

The best statistics for machine tools I could get show \$0.325 in 1900; \$0.399 in 1905, or an increase of nearly 23 per cent., while 1910 shows only \$0.428, or an increase of only 7 per cent.

Now, while this period of five years was taking place and the two years since, this country has added over 11,000,000 people to its population. The time has got to come, and that pretty soon, when the machinery which provides this great mass of people with the necessities of life as well as the increasing luxuries will have to be replenished and increased through our means. And this replenishment will be no small item in the swelling of our business.

During the boom which struck us in 1905 great industries awoke to the fact that the new high-speed steels that were then coming into prominence meant dollars in their pockets if they could crowd their machines to the limit of their capacity, but found that this steel had outstripped the machines in which they were trying to use them. We all quickly realized the importance of this demand and redesigned our product to meet the new conditions. This replacing of obsolete machines then had only just begun when the freeze-out came in 1908. What this demand will mean, added to the legitimate increase, we can only conjecture, but it is certainly productive of very rosy dreams.

I could go on almost indefinitely showing you the lamentable condition our railroads are in with regard to new equipment, extensions and facilities to care for this rapidly growing country, but you are all as well aware of this as I am. What interests us most is what the signs of the times indicate for the immediate future.

The Immediate Future

Two weeks ago, in the issue of May 2, *The Iron Age* said:

With the larger steel companies generally filled up for three months and on some products for four or five months, and with indications that the material bought at low prices in the past six months is entering into consumption without accumulations in second hands, the seller's position is stronger than at any time this year. A significant fact is that second orders for rails have already come from some lines and it is evident that other roads failed to cover all their requirements in their original contracts for 1912. . . . Chicago and Buffalo have had another week of free buying in foundry and malleable irons, and in the former market local irons have advanced 25 cents.

Last week's issue of *The Iron Age* says:

Our statistics of pig iron production in April confirm what has been indicated by recent reports from steel making centers—that the country is now producing and consuming steel at the highest rate in its history. Other important developments of the week are continued heavy buying by railroads, further strengthening in the price of steel making iron in the Central West and of Southern foundry iron, and a condition in the Connellsville field that makes expansion in coke production unlikely and hence limits pig iron production. . . . Railroad buying is still the outstanding feature of the situation. About 200,000 tons of rails and nearly 60,000 cars are reported to be under consideration. The Missouri Pacific has bought a portion of the 30,000 tons for which it was inquiring, the St.

Louis & San Francisco has placed 40,000 tons and the Soo Line 10,000 tons. The Seaboard Air Line is about to buy 17,000 tons and the Atlantic Coast Line is in the market for a second lot. The Harriman Lines will place a considerable order for new track. The car orders of the past 10 days amount to about 25,000, including 7000 for the Frisco System.

This, with the showing on the chart of the three recent advances of prices at Philadelphia, makes us hope that the country is going to be sane this summer and fall and reap the harvest the natural demands are crowding upon us. If we are not, I am very much afraid we shall find business following the downward trend as indicated in our chart, but I have a greater faith in the American people than to believe this will come to pass. The only definite prediction I can make is that when the country does settle down and confidence returns, conditions are such that the machine tool industry will have the greatest volume of business in its long and glorious history. When this definite prediction will take place I defy anyone to foretell.

Norfolk Supply Conventions

Elections of Officers Bring to a Close the Joint Triple Convention

After a strenuous three days, the joint triple convention of the National Supply and Machinery Dealers' Association, the Southern Supply and Machinery Dealers' Association and the American Supply and Machinery Manufacturers' Association was brought to a close on the afternoon of May 15 at Norfolk, Va., with votes of thanks to the Entertainment Committee of that city and all others who had helped to make the gathering a success. At the end of the first day's proceedings, of which an account was given in last week's issue of *The Iron Age*, there were over 500 delegates officially registered at the registration bureau.

Discuss Penny Postage and Banking

On the morning of Tuesday, May 14, the three associations assembled in joint meeting at the Granby Theatre with Willard Parker, the retiring president of the American Supply and Machinery Manufacturers' Association, presiding. The delegates were welcomed to the city of Norfolk by Capt. W. R. Mayo, after which came an address on "One-Cent Letter Postage" by George T. McIntosh, secretary of the National One-Cent Letter Postage Association of Cleveland, Ohio; and on "The National Banking and Currency Problem" by James A. Fulton, secretary of the American Monetary League and city treasurer of McKeesport, Pa., and John Perrin, of Pasadena, Cal., a member of the Currency Commission of the American Bankers' Association. In the discussion of the central bank question a part was taken by E. C. Hinman of the American Steam Pump Company, Battle Creek, Mich.; John Trix of the American Injector Company, Detroit, and D. K. Swartwout of the Ohio Blower Company, Cleveland, Ohio.

American Supply and Machinery Manufacturers

Tuesday afternoon was devoted by the American Association to an address on "The Restoration of Our Flag to the Merchant Shipping of the High Seas" by James L. Ewell of the National Merchant Marine Association, New York, and another on the "Panama Canal and Restoration of American Merchant Marine" by Samuel H. Barker, financial editor of the North American, Philadelphia, Pa. Mr. Barker asserted that the opening of the Panama Canal will afford a way of encouraging American shipping without discrimination or favor. He urged that false sentiment and generosity in the matter be set aside; that the nation has a right to take for itself the larger benefits and that to any and all American-built ships should be given the free use of the canal.

The morning of Wednesday was given by the manufacturers to a business session winding up the programme of that organization and the election of officers. The constitution of the association was changed by resolution to enable the president to appoint as a nominating committee the five ex-presidents whose terms of office next precede the existing administration, the chairmanship to be determined by seniority of office. It was also resolved to provide for the appointment of a labor legislation committee of seven members for the ensuing year. A reso-

lution was adopted extending sympathy to M. W. Mix of the Dodge Mfg. Company, Mishawaka, Ind., and to Mrs. Mix, who had been called home by a telegram on Tuesday because of the serious illness of a member of the family. D. K. Swartwout, then, after a severe mock arraignment of Willard Parker for alleged malfeasance in office, presented to the surprised retiring president a costly silver tea service.

Officers for the ensuing year were elected by the American Supply and Machinery Manufacturers' Association as follows:

President, N. A. Gladding, E. C. Atkins & Co., Indianapolis, Ind.; first vice-president, D. K. Swartwout, Ohio Blower Company, Cleveland, Ohio; second vice-president, C. H. Jenkins, Moran Flexible Steam Joint Company, Louisville, Ky.; third vice-president, Farnham Yardley, Jenkins Bros., New York City; secretary-treasurer, F. D. Mitchell, 309 Broadway, New York City, re-elected. Executive Committee—R. T. Hodgkins (chairman), Yale & Towne Mfg. Company, New York City; John K. Broderick, Broderick & Bascom Rope Company, St. Louis, Mo.; Joseph M. Hottel, Delta File Works, Philadelphia, Pa.; John W. Macomb, New York Belting & Packing Company, New York City; Neil W. Snow, Detroit Twist Drill Company, Detroit, Mich. Advisory Board (consisting of ex-presidents)—Samuel L. Moyer, Lunkenheimer Company, Cincinnati, Ohio; Melville W. Mix, Dodge Mfg. Company, Mishawaka, Ind.; John Trix, American Injector Company, Detroit, Mich.; S. P. Browning, Ohio Valley Pulley Works, Maysville, Ky.; Willard Parker, Pennsylvania Shafting Company, Spring City, Pa.

National Supply and Machinery Dealers

The afternoon of the second day's session of the National Supply and Machinery Dealers' Association included a report of the Membership Committee, which showed that 16 large houses had been added to the roll of members during the year. There also were discussions on these questions: "Problems of the Sales Manager," "The Cost of Doing Business and the Increase of Profits Needed to Meet Same" (by W. B. Yost, manager supply department, the Lockwood-Luetkemeyer-Henry Company, Cleveland, Ohio); "Credits," "Yearly Contracts with Consumers" (by M. B. Barkley, Cameron & Barkley Company, Charleston, S. C.); "Discount Sheets" and "Compensation of Salesmen." On Wednesday morning there was discussion on the following topics: "Manufacturers' Competition—How Can the Jobber Be Placed in a Position to Sell Goods on as Favorable Basis as Does the Manufacturer and Still Have a Fair Profit?" "Stock Systems," "Importance of Salesmen's Advance Cards," "Percentage of Returned Goods and Policy Relative Thereto," "Salesmen's Expense Account and Expense Reports."

The National Supply and Machinery Dealers' Association re-elected its entire board of officers as follows:

President, W. L. Rodgers, Pittsburgh Gage & Supply Company, Pittsburgh, Pa.; first vice-president, Henry Prentiss, Prentiss Tool & Supply Company, New York City (in charge of machinery interests); second vice-president, J. O. Harron, Harron, Rickard & McCone, San Francisco, Cal. Advisory Board—Edgar E. Strong, Ohio; Strong, Carlisle & Hammond Company, Cleveland, Ohio; George Puchta, Queen City Supply Company, Cincinnati, Ohio; W. M. Pattison, W. M. Pattison Supply Company, Cleveland, Ohio. Executive Committee—Charles S. Farquhar, Chandler & Farquhar Company, Boston, Mass.; M. B. Barkley, Cameron & Barkley Company, Charleston, S. C.; George Vonnegut, Vonnegut Hardware Company, Indianapolis, Ind.; W. T. Todd, Somers, Fidler & Todd Company, Pittsburgh, Pa. Secretary-treasurer, Thomas A. Fernley, Philadelphia, Pa.; advisory secretary-treasurer, T. James Fernley, Philadelphia, Pa.

Southern Supply and Machinery Dealers

In executive session Tuesday morning the Southern Supply and Machinery Dealers' Association discussed several questions of vital importance to their trade affairs, among them being: "Special Premium Inducements Made to Jobbers' Salesmen by Manufacturers," "Resale Prices," "Whole-hearted Support of Manufacturers by Jobbers and Vice Versa," "Advantage to Jobber in Having Weight on Direct Shipment of Fittings, Brass Goods, Bolts and Nuts Increased to 1000 Pounds or More."

In regard to "Resale Prices" the association reaffirmed its position of several years as favoring the prices fixed by manufacturers, though without agreements or contracts to maintain those prices.

The Southern Association also listened to an informal address on association work by John Donnan, secretary-treasurer of the Southern Hardware Jobbers' Association, Richmond, Va.

At the morning session of the third day the Southern Association elected the following officers:

President, S. M. Price, S. M. Price Machinery Company, Norfolk, Va., re-elected; first vice-president, I. F. Young, Young & Vann Supply Company, Birmingham, Ala., re-elected; second vice-president, John A. Harvin, Peden Iron & Steel Company, Houston, Texas; secretary and treasurer, Alvin M. Smith, Smith-Courtney Company, Richmond, Va., re-elected. Executive Committee—H. C. Clark (chairman), Charlotte Supply Company, Charlotte,

N. C.; J. G. Barkley, Cameron & Barkley Company, Tampa, Fla.; Ernest Howell, Capital City Supply Company, Charleston, W. Va.; J. A. Riechman, Riechman-Crosby Company, Memphis, Tenn. Chairman Manufacturers' and Conference Committee, W. H. Banks, Banks Supply Company, Huntington, W. Va., re-elected.

The closing session of the convention, a joint meeting of the three new executive committees, was held Wednesday afternoon on board the steamer Maryland while the delegates were enjoying a harbor outing in Hampton Roads. There previously had been meetings of each of the new executive committees singly. By resolution agreed to by each association, the question of a convention city for 1913 was left to a joint meeting of not less than three members from each committee to be held at some central point in October, 1912, as may be arranged by the presidents of the three associations. The joint meeting of executive committeemen will have full power to determine the time and place for the next convention.

The Steel Corporation Dissolution Suit

Chairman Topping of the Republic Company
Examined on a Wide Range of Subjects—
Tin Plate and Bridge Company Competition

The hearing of testimony in the suit of the Government against the United States Steel Corporation was adjourned at the Custom House, New York, on Thursday, May 16, until Tuesday morning, May 21. Following the testimony of Daniel G. Reid, first president of the American Tin Plate Company, which was reported in *The Iron Age* of May 16, the Government sought to bring out the facts concerning reputed contracts between the American Tin Plate Company and manufacturers of rolls and mill machinery. Harlow B. Wheeler, secretary and treasurer of the American Sheet & Tin Plate Company, was put on the stand to produce these contracts. He reported that some of the papers asked for by the Government could not be found and recalled that a number of years ago, after the absorption of the American Tin Plate Company by the United States Steel Corporation, many accumulated papers of the former had been destroyed, having become "obsolete and useless." Mr. Wheeler's best recollection was that these papers were destroyed in 1904 when the offices of the company were removed from New York to Pittsburgh. Asked by Government counsel whether the contracts referred to specified that the machinery manufacturers should not sell equipment to other tin plate companies, he replied that he could not remember. He was asked whether he had had in his custody contracts with roll manufacturers under which his company was to take the output of these manufacturers for a series of years, and replied that there were contracts of that general character, but they were among the papers destroyed.

Judge Dickinson, for the Government, next asked for contracts with the American Can Company which provided for a concession in price. Mr. Wheeler said that he had two contracts with the American Can Company, but at this juncture Mr. Lindabury, of counsel for the Steel Corporation, said:

"The company produces these contracts here, but it declines to produce them under the subpoena to go into the records. They would have no bearing on the case and would simply disclose the business of the company."

It was agreed between counsel that this point would be left in abeyance and would be taken before the United States Circuit Court for decision, along with other questions in dispute which might come up later. Judge Dickinson also asked the witness for papers concerning the organization of the American Sheet Steel Company, but he said he had never had any papers of that character.

Sheet and Tin Plate Meetings

Howard M. Davis, formerly connected with the sales department of the American Sheet & Tin Plate Company, and now at Philadelphia for the Phillips Sheet & Tin Plate Company, told how prices were discussed at a series

of meetings beginning in the latter part of 1907. Separate meetings of sheet makers and tin plate makers were held, he said. E. T. Weir was chairman of the tin plate meetings and James A. Campbell of the sheet makers' meetings.

Q.—Did you discuss prices? A.—Yes.

Q.—After the discussion was there a general understanding that the price would be lowered or advanced? A.—Yes. There was no agreement, but each man would say for himself that he intended to make such and such a price.

Q.—Did they all make the same price? A.—Yes.

Q.—And you stuck to the prices so named? A.—We did; some of the others didn't.

Q.—Well, if anybody didn't stick to the price, what happened?

A.—We made an investigation. It usually appeared that he had made a mistake.

Q.—You mean he said he had made a mistake? A.—Yes.

Q.—Would it be brought to the attention of the chairman? A.—Usually. There would be a meeting and somebody would say: "If you cut the price and demoralize the market, we will demoralize it too." Then he usually explained that one of his salesmen had made a mistake and he would correct it.

Q.—He would promise better conduct? A.—Yes.

The effort was made to show that Judge Gary appointed the chairmen of these meetings, but the witness did not know about this. He testified that about 85 per cent. of the brands of tin plate belonging to jobbers were assigned to the American Tin Plate Company under contracts, and credit allowances of 1 to 3 per cent. were made to firms taking all their supply from the American Tin Plate Company. Later the requirement was changed from all their product to 90 per cent., and then 85 per cent.

James T. McFarland, of Gummey, McFarland & Co., Philadelphia, testified that in order to get tin plate from the American Tin Plate Company his firm had made an assignment of its private brand and had agreed to purchase all its supply from the former. These contracts were drawn up in 1900 and continued until 1908. Discounts were made by the American Tin Plate Company to such customers and later the proportion they were required to buy from that company was reduced. Mr. Reid asked in cross examination if independent companies would not make similar discounts to get such business, and the witness replied, "I think not."

William E. Reis, who was president of the National Steel Company, gave testimony as to the competition that existed among plants taken into the National Steel Company and among the National, Federal, and Carnegie Steel companies before they were merged in the Steel Corporation.

Testimony of John A. Topping

Chairman John A. Topping, of the Republic Iron & Steel Company, went on the stand Tuesday afternoon, May 14. His examination lasted throughout Wednesday

and was concluded Thursday morning. His connection with the American Sheet Steel Company, later with the American Sheet & Tin Plate Company, and with the Tennessee Coal, Iron & Railroad Company, made him a participant in a good many important events in the history of the steel trade in the past dozen years, and both sides questioned him at length.

The Tennessee Company Purchase

Mr. Topping, in answer to questions, went over the familiar story of the Tennessee company purchase by the Steel Corporation—ground which he covered quite fully in his testimony before the Stanley Committee. He told of the \$8,000,000 worth of improvements put upon the company's properties in the Birmingham district after the syndicate of which he was a member took hold of them. While he was unable to speak definitely, he would not be surprised to learn that the Illinois Steel Company in Chicago was able to produce pig iron as cheaply as the Tennessee company—a statement which appeared to take Government counsel by surprise, their claim being that the Tennessee company's cost was the lowest in the country. The uniqueness of the Tennessee company's position as a producer of open hearth rails had been asserted in the Government's petition, but Mr. Topping indicated the Bethlehem Steel Company as also making open hearth rails, but not Bessemer rails, in 1907.

In reply to a direct question, Mr. Topping said that he had sold his Tennessee company interest in 1907 because he did not wish to remain a minority stockholder. Asked whether Mr. Frick or Judge Gary or anybody connected with the Steel Corporation had had anything to do with bringing about a situation which resulted in the sale of the stock, he replied that he did not think at the time that such was the case and did not think so to-day.

Before the session closed Mr. Topping replied to Attorney Lindabury's remark that he would be interested to know whether the advent of the Steel Corporation in the South had acted as a blight upon the iron industry by stating that he did not believe the change in ownership of the Tennessee Coal, Iron & Railroad Company had had any effect upon conditions there. They had improved and could not have been better if the change had not occurred.

Generally speaking, the witness did not consider the Southern iron and steel industry to be in a flourishing condition. His own company, the Republic, had been operating to 100 per cent. of capacity in the past 18 months, and the Woodward Iron Company had been running at a good rate and doing well.

The Break in Prices in 1911

Judge Dickinson referred to the meeting of the directors of the American Iron and Steel Institute in May, 1911, at which Mr. Topping announced that his company would reduce the price of steel bars. Mr. Topping said it was an informal meeting in the Hudson Terminal Building, New York.

Q.—How did you come to make the announcement there? A.—I was at the meeting, and there were eight or ten manufacturers present. I thought it was a good time to announce the reduction, so that all of them would know about it.

Q.—Was the meeting called for the purpose of getting this information? A.—I am not sure whether it was or not, I don't think so.

Q.—Did you feel under obligations to tell your competitors at what price you were going to sell? A.—I felt a certain moral obligation. It was the custom of the different companies to exchange information.

Referring to the "Gary dinners," Judge Dickinson asked if the manufacturers were not told there by Judge Gary that there was an obligation on them "dearer than life" to maintain prices, and whether Judge Gary did not say at the dinner of January 11, 1911, that each must be satisfied with his proportion of the business.

A.—I do not especially recollect that.

Q.—Was not the effect of these meetings to maintain prices? A.—Yes, but there was no feeling that the necessity was "dearer than life."

Q.—Do you recall that at that dinner Judge Gary spoke of the high moral obligations each one present owed to his duty, of the necessity of refraining from trespassing on his neighbor's territory, etc.? A.—Oh, in a general way, yes.

Q.—Were these remarks taken seriously? A.—Not as seriously as report has led you to believe. Some allowance should be made for post-prandial oratory.

Mr. Topping, asked whether he had ever participated in a pool, said he had not, but only because he had not had an opportunity. He believed a pool to be a highly desirable business arrangement and he would now participate in one if it could be legally arranged.

The Bridge Builders' Society

John Sterling Dean, of the Phoenix Bridge Company, on direct examination by Judge Dickinson, said that during the last year the American Bridge Company had obtained business to its full capacity, while the independent companies had to run on 40 to 60 per cent. of their capacity. When asked on cross examination where he obtained these figures, he said they came through the Bridge Builders' Society, of which 25 independent bridge builders outside of the American Bridge Company are members. It was shown in further testimony that Arthur Eddy, attorney for the association, which has headquarters in New York, devised its plan of organization.

Q.—Do you sometimes put in sealed bids? A.—We did, but we gave it up about two months ago.

Q.—When you made sealed bids, what did you do? A.—As soon as we mailed a bid we sent a duplicate to the secretary of the society.

Q.—What did he do with them? A.—He kept them private.

The witness added that sealed bids are still made on contracts, but that the duplicates sent to the society are not kept sealed, but are disclosed to competitive bidders.

Q.—When are the meetings held? A.—Every month; the secretary reports to the whole society the tonnage taken by each member during the preceding month.

Q.—Are the prices made known? A.—Every man that bids on a piece of work gets the prices of the other bidders, but the other members do not. Any of them can revise his bid after learning what the others have bid.

Fabricating Bids Known to Members

Mr. Lindabury, for the Steel Corporation, read from a copy of the Bridge Builders' Society's constitution its object, which is "to establish perfect frankness in the exchange of information as to bids, terms and prices." Each member is "free at all times to make such bids, terms, or prices, the only obligation being to file them promptly with the secretary."

Q.—When the authorities of a town want a bridge, don't they ask for sealed bids? A.—Bids are always sent sealed to towns or railroads. The sealed bids used in the society were to seal the information from the other members.

Q.—But bids submitted to customers under seal and therefore secret are sent to the secretary and are open to the other members? A.—Yes.

It developed that Henry E. Colton, of Government counsel, had attended meetings of the Bridge Builders' Society, to see if its methods were legal, the society having invited the Department of Justice to make this investigation. Mr. Dean said that the American Bridge Company when organized controlled about 75 per cent of the class of product made by the Phoenix Bridge Company, but now about 50 per cent., though the other 50 per cent. included many small mills not engaged in interstate commerce.

In the first number of the Optimist, a creditable magazine of 28 pages, which just misses being 7x10 in. in size, the announcement is made that it will appear monthly in the interest of business progress and civic betterment, as the official organ of the Business Men's Club of Cincinnati. That organization has been widely influential in Cincinnati's behalf, and this publication of cheerful name seems calculated to forward the club's work greatly by spreading information among its 1800 members.

The Wiener Machinery Company and its subsidiary companies have moved into larger quarters in the new annex of the Hudson Terminal Building, at 50 Church street, New York, where half of the third floor will be occupied by them. The Wiener Machinery Company has recently increased its capital stock to \$50,000.

The Machinery Markets

There is an absence of big propositions, but enough demands for the fulfillment of small requirements to make the status of the machinery trade fairly satisfactory in nearly every section of the country. New York dealers have received enough orders in the last few days to make the month compare favorably with April, and there are prospects of a still better showing. New England has felt the influence of railroad buying and conditions there appear to have a sound basis. In Philadelphia demands are irregular but fair in volume. Business in Cleveland has been rather light with several inquiries delayed in closing. Cincinnati has been selling to the railroads for replacements and its export trade is good and expected to continue that way for the rest of the year. A healthy condition in both sales and inquiries is reported in Detroit. Small orders have also been the feature in Chicago. Similar conditions prevail throughout most of the South, with repair and construction work most in evidence. Texas has been doing well with a notable activity in oil field developments. St. Louis had a fair run of small business and before it are some good prospects, including the equipment of the Diesel engine plant. On the Pacific coast pumps and electrical and contractors' equipment are in good call, while the machine tool trade is dull. A betterment in trade conditions is reported from Mexico.

New York

NEW YORK, May 22, 1912.

Sales of the last few days in the New York machinery market brought the total of business for the month up to figures that with many dealers equal and in some cases exceed those of April, and with a few days of the month left there are possibilities for a still better showing. The trade has been receiving formal orders for the equipment to go into the new shops of the Delaware & Hudson Company at Watervliet, N. Y., and with these orders there has been a gratifying amount of miscellaneous business which makes a satisfactory showing in the aggregate. The Niles-Bement-Pond Company got the greatest portion of the Delaware & Hudson business, with Manning, Maxwell & Moore and the Prentiss Tool & Supply Company getting orders which ran into very good figures. Orders were placed also among some of the manufacturers of machine tools who sell direct. This list has been pending since the first of the year and the trade is much relieved by its formal closing. There is now before the New York market only one proposition which might be called large, that of the Safety Car Heating & Lighting Company, for its new plant in Jersey City. The last few days have been characterized by a good call for second-hand machinery in addition to other demands.

The Voorhees & Brown Electric Company, Amsterdam, N. Y., has been incorporated with a capital stock of \$10,000. The new company takes over the manufacturing business that was formerly conducted by Voorhees & Brown, a partnership, and has secured additional manufacturing space which is being equipped for the manufacture of a line of electric appliances under the trade name of Marco. The officers of the company are J. H. Voorhees, president; F. W. Brown, vice-president, and A. R. Larson, secretary.

The Consolidated Color & Chemical Company, Newark, N. J., has had plans prepared and will soon begin the erection of an addition 50 x 107 ft. to its plant at Brown and Lister avenues. The estimated cost is \$5,000.

The AnSCO Company, Binghamton, N. Y., will build an addition 60 x 100 ft., five stories and basement, to its factory. The estimated cost of the new building and equipment is \$200,000. The Guarantee Construction Company, New York, has the general contract.

Adriance Platt & Co., Poughkeepsie, N. Y., are completing arrangements for the building of a new plant in Elmira.

The Chemic-Alloy Company, Bradford, Pa., which has established a branch plant at Syracuse, N. Y., in temporary leased quarters, is having plans prepared for a factory of its own which it will erect in the latter city.

The Simonds Mfg. Company, Lockport, N. Y., is completing arrangements for the erection of an addition to its steel mills on Ohio street and the New York Central Railroad, that city. Test wells for natural gas are to be sunk near the plant and if gas is found in sufficient quantities it will be substituted for coal in the company's furnaces and reheaters.

The Cortland Forging Company, Cortland, N. Y., is taking bids for a one-story and basement addition which it will make to its forging plant.

The Rochester Asbestos Shingle & Fireproofing Company, Rochester, N. Y., recently incorporated with a capital stock of \$150,000, has had plans completed for a three-story factory building 80 x 132 ft., of brick, fireproof construction, which it will erect at Gates, N. Y.,

for the manufacture of asbestos shingles, fireproofing material and builders' supplies. C. A. Briggs, W. H. Karnes and W. G. Gilbert, Rochester, are the directors.

Bids are being received for the construction and equipment of the new power plant of the Olean Electric Light & Power Company, mentioned last week, to be erected at Fifteenth and Irving streets, Olean, N. Y. The building will be 160 x 176 ft., of brick with concrete floors and fireproof construction. The initial equipment of the plant will comprise three Babcock & Wilcox boilers and a 750-hp. turbine with direct connected generator. A second unit of the same power will be installed within a year and space will be provided for other units as the development of the plant requires. The new plant will supply power for a traction line as well as current for electric lighting for the city. The estimated cost of the new plant with equipment is \$250,000 and the Public Service Commission, Second District, State of New York, has authorized the expenditure of that amount by the company.

The Mohawk Gas Company, Schenectady, N. Y., has been authorized by the Public Service Commission, Second District, to issue common capital stock to the amount of \$90,000 to be used for extensions and improvements of its manufacturing and distributing system, including installation at its gas plant of an exhaustor extractor and station meter.

The Niagara Bag & Paper Company, North Tonawanda, N. Y., has completed plans for an addition to its factory on Robinson street, which it will build at once.

The Wayne Power Company, Sodus, N. Y., has been granted permission by the Public Service Commission to furnish electricity for light, heat and power to the town and village of Cohocton, N. Y. The work of constructing the plant and installing equipment will be commenced at once by H. H. Simmons, of Webster, N. Y., who has the contract.

The Seneca Falls Water Company, Seneca Falls, N. Y., is taking bids through its engineers, Stone & Son, Mann Building, Utica, N. Y., for the construction and equipment of a water works system at Seneca Falls.

The Eastman Kodak Company, Rochester, has let the contract to A. Friederich's Sons Company, Rochester, for the construction of its factory building No. 43, which is to be 80 x 100 ft., three stories.

The Niagara Falls Linen Company, Niagara Falls, N. Y., has been incorporated with a capital stock of \$150,000 for the manufacture of textiles, etc. Arrangements for the establishment and equipment of a plant have been completed. G. R. Shepard, A. B. Chase and A. H. G. Hardwicke are the incorporators.

The Hind Hoisting Machinery Company, Buffalo, N. Y., which recently increased its capital stock to \$60,000, has purchased the plant of the Riverview Bronze Company at Gull street and the New York Central Railroad belt line. The plant will be equipped with machinery for the manufacture of hoisting machinery and other apparatus and equipment for contractors' plants. William Hinds is president of the company.

The Buffalo Bridge Company, Buffalo, has been incorporated with a capital stock of \$50,000 to fabricate and erect structural steel work, etc. The company is building and equipping a plant at Bailey avenue and the Erie Railroad. The directors of the company are Harry A. Feindt, Jr.; John F. Miller, Michael J. Skelly, George L. Ballou and Louis Fechter, Jr.

The Acme Steel & Malleable Iron Works, Buffalo, E. G. Felthousen, president, has purchased additional land 150 x 371 ft. with railroad facilities adjoining its

plant at Military Road, Chandler street and the New York Central Railroad belt line and will later build an addition, including a machine shop.

The Buffalo Corrugated Container Company, Buffalo, has let contract for a two-story brick factory which it will erect at Ivason street and the Lehigh Valley Railroad.

The J. M. Pease Mfg. Company, Buffalo, has purchased the large factory of the Kimo Specialty Company at Main street and Fillmore avenue with automatic machinery and patents for the manufacture of Kimo polishes and will continue their manufacture in addition to the specialties now made by the Pease company. Some additional equipment will be installed later.

New England

BOSTON, MASS., May 22, 1912.

The trade looks to see an early announcement of an advance in prices by some of the machine tool builders and anticipates that the industry as a whole will follow to lead as the momentum of better business accumulates. Higher prices are inevitable. During the dull times certain concessions have been granted to buyers in some cases, but as a whole the depression has seen the usual condition of well maintained prices in the face of a dull market. Consequently the manufacturers and dealers are in the enviable position of being able to make a change upward from where they were in 1907. It must be taken into account, however, that the actual value of machine tools has increased during the intervening period and consequently the price must go up a certain extent before it will be on a parity with that of five years ago.

The Rhode Island industrial stocks are developing a tendency upward in the same ratio which prevails throughout New England in the metal industries.

The demand for machine tools and allied lines does not seem to change very much in this section. The influence of railroad buying is beginning to be felt and basic conditions seem absolutely sound.

Charles Napier, Springfield, Mass., manufacturer of hack saws and hacksawing machines, will build a new factory at 229 Armory street 50 x 200 ft., with ell 50 x 50 ft., one story, of brick with steel frame.

The W. A. Cairns Woodworking Company, East Hartford, Conn., will erect a plant consisting of a three-story brick building 60 x 95 ft., with a one-story extension 25 x 40 ft.

The report is current in Springfield, Mass., that the Bosch Magneto Company is preparing to abandon its factory in that city and move to Hartford, Conn. The company has been endeavoring to have the authorities remove a nuisance in the form of rendering works, and thus far has been unsuccessful. The report is not verified by the company, which declines to state its plans.

The E. J. Manville Machine Company, Waterbury, Conn., manufacturer of heading machinery, thread rolling machinery, power presses and other machinery, is planning to increase its works and will build in the fall, and, if not then, surely next spring.

The Cooper Oven Thermometer Company, Terryville, Conn., will erect an addition to its factory 34 x 50 ft., two stories, of mill construction.

The new forge shop of the Blakeslee Forging Company, Southington, Conn., will be 50 x 220 ft., one story, with steel truss roof. Plans are also preparing for a machine shop 30 x 160 ft., three stories, of brick and steel construction, with reinforced concrete floors.

The Fiberloid Company, Springfield, Mass., will build a factory at Indian Orchard, a suburb, 58 x 165 ft., three stories and basement.

The Bristol Brass Company, Bristol, Conn., has voted to increase its capital stock from \$600,000 to \$800,000.

The Hebert Mfg. Company, Franklin, N. H., has established a factory for the manufacture of piston rings. N. H. Hebert is the general manager of the business.

Skinner, French & Co., Lowellton, Me., plans to establish a large plant at Bingham, Me., for the manufacture of packing cases, piano sounding boards and other wooden products.

The Lincoln Iron Works, Rutland, Vt., has brought out a new diamond saw for use in the stone cutting business.

The H. P. Townsend Mfg. Company, Hartford, Conn., manufacturer of high speed riveting machines and special machinery, will take 4800 sq. ft. of additional floor space and will fill it with new machine tools. The company reports an increasing demand for its products and a noticeably larger number of inquiries.

Philadelphia

PHILADELPHIA, PA., May 21, 1912.

Orders for machine tools have been largely against long pending inquiries and some lists which have been under negotiation for considerable time have been cleaned up by the purchase of odd tools. Business generally is still irregular. Merchants report no uniform improvement and periods of comparative stagnation usually follow almost every little gain in activity. Machine tool builders also report but little general betterment. A larger volume of business is evidently being placed, but it is usually so scattered among various builders that the individual gains are small. Some builders of the small special tools are better engaged, but those making the heavier special equipment note little real improvement. Considerable attention has been given the National Tool Builders' convention at Atlantic City last week, representatives from practically all the tool builders as well as the merchants being in attendance.

There has been some improvement in the demand for electric traveling cranes, although the bulk of the inquiry is for those in the moderate and smaller capacity. An absence of any material demand for machine tool equipment coming from the railroads in this vicinity is still noted. Some small equipment recently inquired for by the municipality is expected to be closed at an early date, although no further inquiry has come out. Boilers and engines continue in fair demand, although business closes slowly. Little new developments in the export trade are noted. A moderate volume of business continues to develop in second-hand machinery and tools, but the demand, on the whole, still continues irregular.

The general foundry trade is somewhat better engaged; both steel and gray iron castings have been in better demand and order books are in somewhat better shape, although in but few instances is sufficient work on hand to insure full capacity operation for any lengthy period.

The contract for the construction of the Hotel Vendig, at Twelfth and Filbert streets, has been awarded to Doyle & Co., who have begun the operation of the preparing of the site.

The Pennsylvania Equipment Company, West End Trust Building, is in the market for a rolling mill engine, size 28 x 36 in., left hand, with heavy duty frame.

The Ajax Metal Company expects to begin work in the near future on its new plant at Orthodox street and Delaware avenue erecting two buildings, one 35 x 240 ft., for general storage purposes, and another for a smelting plant. M. Ward Easby is the engineer. It is the company's intention to transfer its smelting department from its present plant at Richmond street and Frankford avenue on the completion of the buildings. It will then rearrange the old smelting department for foundry purposes, enabling it to double its present capacity in metal alloy castings.

Local contractors have been figuring on a brick factory building 44 x 111 ft., three stories, to be erected in Riverside, N. J., for Henry Taubel & Sons. Details as to the probable equipment are not available.

Lloyd Titus, architect, 430 Walnut street, has been taking bids for a large garage to be erected at 1811 to 1821 Master street, for William J. McMullin. The building is to be two stories, heated by steam.

The Superintendent of the Mint, Philadelphia, will take bids until May 24, noon, for general supplies during the year ending June 30, 1913.

It is currently reported that the Suburban Gas Company, Chester, Pa., contemplates considerable addition to its plant at Front and Tilghman streets, in that city. Among other things the erection of a large gas tank is being considered.

The Brann-Stuart Company, contractor and engineer, Arcade Building, has purchased a tract of 30 acres at Bleight and Tacony streets on which will be erected a structural steel and corrugated iron storage shed 65 x 120 ft., which will be used for the storage, repair and maintenance of the various equipment used in its contracting business.

Reports continue to come out, usually without much foundation, regarding plans for the construction of a subway in Broad street. Considerable difficulty in financing such a project has been met by several concerns interested and definite developments still drag. An unconfirmed report is that the Rapid Transit Company would finance a project of the building of this subway.

The Philadelphia & West Chester Traction Company contemplates the building of an extension from Drexel Hill to Media, Pa. The proposed line will run through

upper Darby, Springfield and Nether Province townships, of Delaware County, connecting with the system of the Philadelphia Rapid Transit Company at Sixty-ninth and Market streets. The road will be about six miles in length and it is reported that plans being considered include the enlargement of the present power house at Llanerch, Pa.

The Schuylkill Forging & Steel Company, Schuylkill River and Bainbridge street, is erecting a one-story structural steel and brick forge shop 40 x 130 ft. on a two-acre tract of land recently acquired at Pike, Luzerne and Third streets. A one-story office building will also be erected. The company has provided for the power equipment and will remove the machinery at its present plant to the new one when it is completed. While nothing definite as to additional forging equipment requirements is available at the present time, it is possible that some further purchases will be made later on.

R. S. Stoneback, secretary of the Town Council, Emaus, Pa., will receive bids until June 3, 1912, for a steam road roller. A certified check of 10 per cent. of the amount of the bid must accompany each bid.

The Beacon Light Company, Chester, Pa., is making extensive improvements to its power plant. A 5000-kw. horizontal type Curtis turbine, built by the General Electric Company, is to be installed; also four 500-hp. water tube Edgemoor boilers for use in connection with the new turbine plant. The company is also planning to erect an overhead coal conveyor, which will enable it to handle fuel direct from its dock. The additional power will practically double the capacity of this plant.

Local interests in which James R. Gibney & Brother are interested are considering the taking over of the old J. Elwood Lee Company's plant, Norristown, Pa., with a view of using it for the manufacture of automobile tires.

The Parish Mfg. Company, maker of pressed steel automobile frames, Reading, Pa., has purchased property in Detroit, Mich., where it expects to locate a plant in the near future. The company has a temporary office in the Ford Building, Detroit, Mich., C. M. Hall being in charge.

Chicago

CHICAGO, ILL., May 21, 1912.

With the exception of such important inquiries as have already been mentioned, some of which are still unplaced, local machinery sales have been confined very largely to individual purchases of one and two machines. There is a considerable quantity of this kind of buying, of which the inquiry of Powers & Williams, Streator, Ill., for a lathe, shaper and drill press is an example. Another inquiry for a new machine shop amounting to about \$3,000 is noted. A maker of motor cycles at Milwaukee is building an addition to its plant and will require a number of new machines. Increases of plant capacity are more numerous than for several months past and while a number of them are small there is some ground for expecting a continuous inquiry of satisfactory volume.

The David Bradley Mfg. Company, Bradley, Ill., is in the market for new wood shop machinery, including single and double surfacers, hand jointers, shapers, sanding machines, tenoners, rubbish hog, rip saws, band saws, cut-off saws, a resaw, saw tables, knife grinders and boring machines.

Templeton-Kenly & Co., Ltd., 1335 Sloan street, Chicago, manufacturers of railroad supplies, have arranged for the building of a factory 200 x 300 ft., one story.

The Raymond Bros. Impact Pulverizer Company, Chicago, manufacturer of pulverizing and air separating machinery, have purchased property on which a large machine shop and office building will be erected. The building will be equipped with traveling cranes and all of the machinery will be electrically driven.

The Smith & Phillips Mfg. Company, Chicago, has been organized with a capital stock of \$5,000 to manufacture and deal in machinery. The incorporators are C. V. McCullough, William H. McCullough and Mark L. Smith.

The Mechling-Smith Steel Tie Company, Chicago, has been organized with a capital stock of \$100,000 by W. W. Mechling, Frank B. Tomb and Carl H. Pomeroy, to do a general manufacturing and merchandising business.

The Utopian Power Company, Chicago, has been organized with a capital stock of \$40,000 to manufacture and deal in engines, machinery and merchandise by Lewis Kessler, Robert F. Heap, Lucy R. Heap and J. D. Price.

William H. Ziock, Rockford, Ill., president of the B. Z. B. Knitting Company, will build a 10-story factory building 56 x 156 ft., at an estimated cost of \$100,000. The building will be sublet for power purposes.

The Cowboy Tank Heater Company, Mendota, Ill., is building a new shop 40 x 104 ft.

The Oliver Typewriter Company, Woodstock, Ill., will build an addition to its plant at a cost of \$2,000.

The Allaire-Woodwork Chemical Company, Peoria, Ill., is building a four-story addition to its plant to cost \$10,000.

The Chamberlain Metal Window Strip Company, whose plant at Detroit was burned early in the year, has arranged for the building of a new factory at Peru, Ill.

The Nichols Mfg. Company, Ottumwa, Iowa, is making preparations for the building of an addition to its plant 100 x 200 ft., an expansion occasioned by a rapid growth in the company's business.

The Giant Mfg. Company is to be reorganized with a capital stock of \$25,000 and a factory is to be built at Council Bluffs, Iowa. G. J. Harding, of that city, is president and O. M. Hall secretary and manager.

The Marinette Iron & Metal Company, Marinette, Wis., Peter Arnivotz, proprietor, will erect a large machinery repair shop.

The William J. Hess Iron Works, Green Bay, Wis., has been incorporated under the name of the Hess Iron Works with a capital stock of \$25,000 to manufacture patented specialties. The incorporators are William J. Hess, Oscar Zapfe and E. E. Brown.

The Malleable Iron Range Company, Beaver Dam, Wis., will add to its present plant four buildings of brick and mill construction to be used for pattern shop, core room and storage purposes.

Alonzo Pawling, Milwaukee, Wis., has obtained permit for the erection of a factory building at Clinton and Oregon streets, in that city, the cost of which will be \$60,000.

The Harley-Davidson Motor Company, Milwaukee, Wis., has obtained a permit for the erection of a reinforced concrete factory providing 90,000 sq. ft. of floor space and to cost \$100,000.

The National Electric Lamp Company, Cleveland, has purchased a site in Minneapolis, Minn., on which a plant will be built at an estimated cost of \$500,000.

The Sioux Falls Light & Power Company, Sioux Falls, S. D., which is owned by H. M. Byllesby & Co., Chicago, will build a new steam plant to cost over \$200,000. It is expected to be a turbine plant.

Detroit

DETROIT, MICH., May 21, 1912.

Conditions in the machine tool business in this district continue promising and trade has been fairly active, although the week has failed to bring out any transactions of magnitude. The usual steady run of single tool propositions is reported. Inquiries from the strictly local market are only fair, but a better volume is reported from the State at large. Reports from a number of manufacturers in the metal trades indicate a general healthy condition, with plants as a whole well engaged. Plant activity among the foundries making steel castings is reported to be gradually increasing. Practically no change in conditions in the gray iron trade is noted. In power plant equipment there is a fair amount of business in sight. The second hand machinery market shows no special activity, but dealers are not inclined to complain of lack of business. The amount of work reported in building circles shows a falling off but a steady call for heating, ventilating and contractors' equipment continues.

Considerable interest attaches to the report of Gardner S. Williams, engineer, made to the Detroit Board of Water Commissioners. The report recommends a new boiler plant, three new high pressure engines, a turbine pumping plant, a new intake tunnel, mains, etc., the estimated cost of which is \$4,000,000. The commissioners are now having plans prepared for a new boiler house and will shortly purchase four new boilers and steps will be taken looking toward the further extension of the city's water system as soon as is practicable.

An important prospective industrial development affecting this city became known the present week in the announcement that the plants of the Lewis Spring & Axle Company and the Clark Motor Company will probably be moved from Jackson, Mich., to Detroit. The concerns, which are practically under one management, make automobile engines, springs and axles. Fred G. Lewis, general manager of both companies, states that the matter is being seriously considered.

Frank C. Root, formerly connected with the Aluminum Castings Company, has acquired a tract of three acres at Grand Boulevard and St. Aubin avenue and it is currently reported will head a new company manufacturing aluminum castings in a plant to be erected on the new site.

The Transport Company has been incorporated with \$5,000 capital stock to manufacture mechanical devices. The incorporators are H. W. Bailey, S. P. Bradley and H. M. Ransom.

T. Schmidt & Son have taken out a permit covering the erection of a one-story brick power house at Monroe and Beaubien streets. Cost, \$7,500.

The Meteor Mfg. Company has been incorporated with a capital stock of \$10,000 to manufacture carburetors, magnetos and other accessories. Ernest L. Morey is the principal stockholder.

The Herreshoff Motor Company, maker of automobiles, has filed amended articles of incorporation increasing its capital stock from \$230,000 to \$430,000.

The Auker-Holth Mfg. Company, Chicago, has acquired the plant formerly occupied by the Huron Body Company at Port Huron, Mich., and will install machinery for the manufacture of cream separators. The company plans to eventually move its entire plant to Port Huron.

The Michigan Carton Company, Battle Creek, Mich., manufacturer of paper boxes, etc., has increased its capital stock from \$400,000 to \$600,000 to provide for its rapidly expanding business.

The Crown Chemical Company, Grayling, Mich., will remove its plant from that city to Cheboygan, Mich., where a larger factory has been secured.

The Standard Rule Company, Flint, Mich., on account of its growing business, will enlarge its plant by the erection of a two-story addition 50 x 40 ft. The company manufactures a line of steel pocket tapes.

The Boyne City Potash Company, Boyne City, Mich., has been incorporated as a reorganization of the Perkins and Olsen potash plants. Considerable modern machinery is being installed.

The Iseman & Parrish Stock Food Company, Hillsdale, Mich., is preparing to remove its business to St. Johns, Mich. A new factory has been secured and the company will operate on a more extensive scale.

The city of St. Louis, Mich., has voted in favor of bonding for \$15,000 for water works extensions and improvements.

The Werner & Pfeleiderer Company, Saginaw, Mich., is preparing to erect a large new factory which will give employment to 1000 men. The company is a manufacturer of all kinds of bakers' machinery.

The Foote-Burr Axle Company, Marshall, Mich., is negotiating with the city for a new factory building. The company manufactures roller axles, thill couplers, etc., and its business has grown to proportions where larger quarters are imperative.

The Brown-Morse Company, Muskegon, Mich., manufacturer of office devices, has acquired the plant formerly occupied by the Grand Rapids Desk Company at Muskegon Heights and will immediately occupy it. Some additional equipment will probably be required.

The Municipal Council of Lawrence, Mich., has decided to rebuild at once the power house recently destroyed by fire.

Armour & Co., Chicago, is having plans prepared for an addition to its grape juice factory at Mattawan, Mich., to be 113 x 113 ft. and three stories. It will be of concrete construction.

Osgood & Osgood, architects, Grand Rapids, Mich., are preparing plans for the new factory building which the Kindel Bed Company will erect in that city.

The Detroit Trust Company, receiver for the New Process Steel Company, Marshall, Mich., called off the sale of the company's plant, held May 15, as no satisfactory bids were received. The probabilities now are that the plant will be dismantled and the machinery disposed of separately.

The Saginaw Sash & Door Company, Saginaw, Mich., has acquired property at Park street and the Michigan Central Railroad and has begun the erection of a plant 100 x 160 ft., two stories and of brick construction. The factory will be equipped with a complete line of modern woodworking machinery.

The Edwin Bell Company, Pittsburgh, has acquired a saw mill property at Engadine, Mich., and will build a heading mill and dry kiln.

The Evert Light & Power Company, Evert, Mich., is planning extensive improvements to its plant and system and will install electric motors to operate the pumps in the water works station.

The Dudley Tool Company, Menominee, Mich., has under way the building of an addition which includes a machine shop 40 x 60 ft. William J. Tideman is secretary and manager.

The Original Gas Engine Company, Lansing, Mich., is planning the erection of a new factory 125 x 300 ft., two stories, for which a site of four acres has been purchased.

Cleveland

CLEVELAND, OHIO, May 21, 1912.

The condition of the machine tool market shows very little change as compared with the early part of the month. Business is light both with dealers and manufacturers. Orders are confined largely to single tools. Inquiries are also somewhat scarce and none of any size has come out. One local inquiry for several tools noted early in the month is still pending. The demand for some lines of special handling machinery has improved and inquiries are fairly active. Builders of industrial cars and locomotives are getting a better volume of business than for some time, but prices are unsatisfactory. There is a fair demand for electrical equipment in this territory, but this is nearly all for small installations.

The Cleveland, South Western & Columbus Railway Company, with headquarters in Cleveland, is in the market for a 3000-kw. turbine for a power house at Elyria, Ohio.

The Suspension Roller Bearing Company, Sandusky, Ohio, expects shortly to place contracts for the erection of a new plant. The company has entered into a contract with the city according to the terms of which it is to build a plant to cost from \$25,000 to \$30,000 to be completed by November 1. The company is given 20 acres as a factory site.

The Alliance Board of Trade, Alliance, Ohio, has let a contract to the McClintic-Marshall Construction Company, of Pittsburgh, for the erection of a new plant 50 x 200 ft. to be occupied by the Davies Mfg. Company, a new concern which will manufacture automobile supplies.

The Taplin-Rice-Clerkin Company, Akron, Ohio, builder of stoves and warm air furnaces, has let a contract for the erection of a large factory addition. The company will erect a building of steel and concrete construction 100 x 180 ft., three stories. It will be used for forging and blacksmith work and for storage purposes.

The Wine Railway Appliance Company, Toledo, Ohio, has been incorporated with a capital stock of \$25,000 to manufacture locomotive and car specialties, patented by W. E. Wine, of Wilmington, N. C. The incorporators are Henry J. Pilloid, Frank C. Miller, Harry W. Isenberg and others. The company will probably establish a plant in Toledo.

The Norfolk & Western Railroad has let contracts for the erection of new shops in Columbus, Ohio. The buildings will include a 25-stall round house, a machine shop 52 x 139 ft. with an annex 35 x 64 ft., store and office buildings. The buildings will be of brick and steel construction.

It is reported from Columbus, Ohio, that the Vulcan Furnace Company, Warren, Ohio, has been consolidated with the Columbus Machine Company and that the combined concern will shortly build a \$50,000 factory building in Columbus.

The Goodyear Tire & Rubber Company, Akron, Ohio, will enlarge its plant by the erection of two or more new buildings during the coming summer. One of the present three-story factory buildings 60 x 296 ft. will be enlarged with the addition of two stories. Another building that is planned will be 79 x 405 ft.

The Defiance Machine Company, Defiance, Ohio, is enlarging its plant by the erection of two saw toothed buildings, one 77 x 132 ft., to be used as an erecting building and the other 97 x 115 ft., to be used as a shafting department, grinding and plating shop and blacksmith shop. The addition will increase the company's capacity 25 per cent.

The Western Reserve Furniture Company, Warren, Ohio, will enlarge its plant by the erection of a two-story brick and steel building 60 x 90 ft. Some woodworking equipment will probably be installed.

The Portage Rubber Company, Barberton, Ohio, will enlarge its plant by the erection of a two-story addition 30 x 90 ft.

The Damascus Brake Beam Company, Cleveland, Ohio, will enlarge its machinery equipment and is in the market for a large riveter, tapper and multiple drill for heavy work.

The Cleveland Electric Illuminating Company has placed an order with the General Electric Company for a 15,000-kw. turbine for enlarging its plant equipment. It is understood that the same company will buy some equipment for two substations.

The Council of Granville, Ohio, is considering the rebuilding of the electric light and water works system of that village and the erection of a sewage disposal plant. The estimated cost of the improvement is \$40,000.

The village of Navarre, Ohio, will receive bids May 27 for a water works pumping station with a capacity of 250 gal. per minute and a steel tank with a capacity of 60,000 gal. Plans are on file with L. E. Chapin, engineer in Canton, Ohio.

The Glacier Mfg. Company, of Pittsburgh, has decided to locate in Youngstown, Ohio, according to reports from that city. Plans have been prepared for the erection of a new manufacturing plant. The company will make refrigerators and pneumatic pumps. J. H. McTighe is president and S. B. Harwood, secretary.

The Toledo Metal Hub Company, Toledo, Ohio, has been incorporated with a capital stock of \$20,000 by Leonhard Bauroth, Emil Bauroth, F. August Bauroth, Hugo Bickel, Georges Mannes and Henry Stautzenbaugh.

Cincinnati

CINCINNATI, OHIO, May 21, 1912.

Machine tool orders are scattered and one firm reports that it has lately received some unexpected business from the Pacific coast. The railroads are also doing some buying, but their orders mainly call for small lots of tools for replacements. The export trade is good and is expected to last throughout the present year at any rate.

Second-hand machinery dealers are only enjoying a fair business and boiler makers in this territory are busier building tanks than turning out boilers. The internal combustion engine demand is excellent, both for small motors as well as for larger engines to drive industrial plants. Some improvement is also noted in the call for electrical generators and motors of the smaller sizes.

The American Tool Works Company, Cincinnati, on account of its steadily increasing business, reports the necessity of putting on a night force in several of its departments.

The foundations for the new addition to the Modern Foundry Company's plant at Oakley suburb have been completed and the building will soon be ready to house the necessary equipment. It is expected to be put in operation before the fall season commences.

The Veitch Motor Mfg. Company, Dayton, Ohio, has been incorporated with \$200,000 capital stock to manufacture automobile specialties. Its present quarters are in the Beaver Power Building, but it is the intention of the company to erect a large factory this summer on a site recently acquired in Edgemont suburb.

The Cincinnati Butchers' Supply Company, Cincinnati, has purchased the old factory of the Blettner Machine Company, adjoining its plant, and will fit it up for the manufacture of refrigerators and other specialties. Special woodworking and other equipment will be required.

The H. C. Hazen Contracting Company, Cincinnati, has contract for building a series of large reinforced concrete coal bunkers for the Reliance Coal & Coke Company.

Considerable structural material will be required for a large warehouse to be erected by the Union Distilling Company, Cincinnati. Heating equipment will also have to be provided for.

The Automatic Machine Company, Cincinnati, has acquired part of the plant of the M. A. Hunt Mfg. Company, in North Fairmont, which will be fitted up for the manufacture of automatic vending devices. Nearly all the necessary equipment has been purchased.

The Crowell Publishing Company, Springfield, Ohio, is adding a large addition to its plant, for which power and transmission equipment will be needed.

The Louisville & Nashville Railroad Company will build a large pumping station at De Coursey, Ky.

The Bertsch Foundry & Machine Company, Cambridge City, Ind., will build a large factory for the manufacture of power punches and shears and other metal-working equipment.

The Allyn Engineering Company, Cincinnati, has contract for erecting an immense warehouse at Lexington, Ky., for which considerable structural material as well as heating equipment will be required.

It is rumored that the Standard Desiccating & Fertilizer Company, Chicago, has purchased a site at Elmwood place, Cincinnati, on which it intends erecting a large fertilizer factory.

The McCormick Mfg. Company, Lisbon, Ohio, has been incorporated with \$10,000 capital stock to manufacture vehicle couplers. No plans have yet been given out. W. L. Ogden is one of the incorporators.

It is reported that the Columbia Cement Shingle & Tile Company, Cincinnati, a new incorporation, has completed plans for a factory to be erected at Columbia and Bonnell avenues.

The Cincinnati Chamber of Commerce has opened a foreign department that will be in charge of Bernhard Freudenstein, who recently came to Cincinnati from Riga, Russia. Thomas P. Egan, president of the J. A. Fay & Egan Company, is chairman of the committee in charge of this department.

The Cincinnati Traction Company, Traction Building, Cincinnati, has had plans prepared for a pumping station to be erected at the foot of the Fairview incline, for which some equipment will be required.

Indianapolis

INDIANAPOLIS, IND., May 21, 1912.

The Deco Mfg. Company, Indianapolis, has been incorporated with \$40,000 capital stock to manufacture wood veneers and their products. The directors are: H. D. Kahblo, A. L. Wilson and W. W. Dark.

The Edwards Instrument Company, Indianapolis, has increased its capital stock from \$10,000 to \$20,000.

The Automatic Machinery Company, Indianapolis, has enlarged its purposes so as to include the manufacture of bottling and labeling machinery.

The Smart Auto & Mfg. Company, Indianapolis, has been incorporated with \$50,000 to manufacture automobiles and automobile parts. The directors are: Brinay Smart, I. H. Shelton, L. W. Willis, Thomas Singleton and W. A. Virtue.

The Halstead-Moore Company, Indianapolis, has been incorporated with \$50,000 capital stock as general building contractors. The directors are: W. C. Halstead, M. J. Halstead, W. V. Halstead, D. V. Moore and D. C. Moore.

The Linden Zinc Company, Indianapolis, has been incorporated with \$10,000 capital stock to refine ores, etc. The directors are: A. P. Craft, L. G. Miller and W. E. Henkel.

The Murdock Veneer & Lumber Company, Indianapolis, has been incorporated with \$25,000 capital stock to manufacture veneer. The directors are: Hugh Murdock, McGavin Murdock and J. A. Murdock.

The Merchants' Electric Light Association, Lafayette, Ind., has increased its capital stock from \$200,000 to \$350,000. A. Rosenthal is secretary of the association.

The Hoosier Veneer Company, whose plant at Ladoga, Ind., was burned, has taken a lease on the idle Advance veneer plant at Indianapolis. Harry E. Daugherty will continue as manager.

The L. & B. Specialty Company, Laporte, Ind., has been incorporated with \$10,000 capital stock to manufacture meat pounders and chopping knives. The directors are: John Line, J. F. Bell and J. R. Line.

The C. F. Schmoe Furniture Company, Shelbyville, Ind., has increased its capital stock from \$10,000 to \$25,000.

The Hoosier Mfg. Company, Newcastle, Ind., maker of kitchen cabinets and other furniture, is preparing plans for additional buildings to cost \$50,000 and which will enable the company to double its output.

Contracts have been signed by the Commercial Club of Valparaiso, Ind., and Pitkin & Brooks, Chicago, by which the latter are to build a glass products plant in Valparaiso to employ 100 men.

The Board of Trustees of the Indiana Village for Epileptics at Newcastle, Ind., will build a laundry, bakery, abattoir, ice and cold storage plant.

The Sanitary Flooring, Marble & Tiling Company, Gary, Ind., has been incorporated with \$10,000 capital stock to manufacture flooring, etc. The directors are: A. T. Hess, Daniel Melloy and W. S. Feuer.

The Northern Indiana Utilities Company, Monticello, Ind., has been incorporated with \$1,075,000 capital stock to supply electricity for light and power. The directors are: Chas. A. Munroe, Chicago; E. D. Alexander and J. R. Catlow.

The Seymour Wood Working Company, Seymour, Ind., has been incorporated with \$15,000 capital stock

to manufacture wooden articles. The directors are: J. H. Andrews, H. C. Johnson and E. L. Hancock.

The Rice-Fenn Hub Company, Jasper, Ind., has been incorporated with \$10,000 capital stock to manufacture hubs. The directors are: William Rice, F. Rice and A. P. Fenn.

The Schroeder Headlight Company, Evansville, Ind., suffered a loss of \$27,000 in the destruction of its machine shop by fire. Work will be continued at the plant and repairs made as rapidly as possible.

The foundry of S. J. Gardner, New Albany, Ind., was damaged by fire recently, the loss being \$1,500. The principal damage was to the building and none of the equipment will need replacement.

The Central South

LOUISVILLE, KY., May 21, 1912.

While trade conditions in this market remain fairly quiet, enough business is being secured to keep most of the plants running full time. In fact, it is reported by some that they are operating full capacity for the first time at this season in several years. The general feeling as to business being dull is probably due to the scarcity of big orders. There is enough small stuff in the market to keep nearly everybody busy. Unseasonable weather continues to hold back developments and is one of the retarding features of the situation. Construction work of all kinds continues to take a lot of equipment.

A. Bentley & Sons, Toledo, Ohio, who have the general contract for the erection of the Louisville city hospital plant, have let contracts for the structural material to the Riverside Bridge Company, Martin's Ferry, Ohio, for the ornamental iron work to the Dow Wire & Iron Works, Louisville, and for the reinforcing bars to the Carnegie Steel Company. Fitzpatrick & Hoepfner, Columbus, Ohio, who have the contract for the mechanical equipment, have ordered boilers, ice machinery and tanks from the Henry Vogt Machine Company, Louisville; engines from the Ridgway Engine & Dynamo Company; motors and generators, the James Clark, Jr., Electric Company, Louisville; elevators, the American Machine Company, Louisville; pumps, Henry Worthington, and pipe, A. M. Byers & Co., Pittsburgh.

The Ohio River Contract Company, Evansville, Ind., has purchased eight Lidgerwood hoisting engines from the Brandeis Machinery & Supply Company, Louisville, for use on a Government job at Henderson, Ky. The contract company has also purchased from the Brandeis concern two 8-in. track channelers and a portable revolving wagon drill. Both of the latter are of Ingersoll-Rand manufacture.

The National Mfg. & Plating Company, 133 North Third street, Louisville, has started a brass and plating plant and will manufacture gas fixtures and other specialties.

The Harlan Coal Mining Company, Louisville, which is developing a large tract of coal lands near Harlan, Ky., has let contracts for the power and mining equipment to the Morgan-Gardner Electric Company, Chicago, and for the conveying machinery to the Jeffrey Mfg. Company. The specifications provide for the installation of boilers of the Skinner Mfg. Company, Pittsburgh, and a generator of the James Clark, Jr., Electric Company, Louisville.

It is reported that the Kentucky Wagon Mfg. Company, Louisville, is considering the installation of equipment for electric welding operations. W. C. Nones is president of the company.

The Henry Vogt Machine Company, Louisville, has secured a contract from the North Star Ice & Coal Company, Knoxville, Tenn., for the installation of a 100-ton refrigerating plant together with full boiler equipment. The demand for power equipment only has dropped off somewhat.

The Louisville Anti-Tuberculosis Association has had plans drawn for an administration building at its hospital. D. X. Murphy & Bro. are architects for the building, which will be equipped with a steam heating plant.

Specifications for the 14-story office building of John P. Starks, Louisville, are now being prepared by McDonald & Dodd. The building will be 14 stories and will be built of steel and brick. The equipment will consist of four elevators, a heating plant, etc.

Lancaster, Ky., has sold \$12,000 of bonds for the purpose of making improvements in its waterworks system.

The Mt. Sterling Water, Light & Ice Company, Mt. Sterling, Ky., has secured a 20-year franchise for the operation of the water and lighting systems. It is contemplating extensions of both.

The Knox County Coal Company, Lexington, Ky., has been incorporated with \$250,000 capital stock for the purpose of developing coal lands in Knox county, Ky. John E. Golden, Barbourville, Ky., and Frank P. James and James R. Curry, Lexington, are the incorporators.

The Board of Control of Charitable Institutions, Frankfort, Ky., will purchase a 500-hp. boiler with underfeed stokers, for use at the western hospital at Hopkinsville. Plans for the improvement have been drawn.

The Eastern Kentucky Land Company, Mt. Sterling, Ky., is planning the development of a deposit of soft sandstone at Cumberland Gap, Tenn., and is asking for prices on equipment for a power plant. Lewis Apperson is secretary of the company.

The Chattanooga Manufacturers' Association, Chattanooga, Tenn., which is composed largely of machinery manufacturers, will enlarge and improve its building, which is used at present for the exhibition of products of Chattanooga factories. Under the new arrangement the entire lower floor will be devoted to the exhibition.

The Memphis Nut, Lock & Bolt Mfg. Company, Memphis, Tenn., has been incorporated with \$500,000 capital stock for the purpose of undertaking the manufacture of locks and bolts. W. T. Peter, G. D. Siler, C. E. Pigford, H. W. German and others are given as incorporators.

T. V. Vigus, Memphis, Tenn., will install a refrigerating plant at a packing house located at Rosemary Farm, near Memphis.

The Hice Mfg. Company, Johnson City, Tenn., is in the market for a considerable lot of used wood-working machinery, including spoke tenoning equipment, sanders and equalizing saws.

The John G. Duncan Company, Knoxville, Tenn., is in the market for a used-15-hp. motor.

C. F. Keifer, referred to recently as being interested in a plan to build a hydroelectric plant on Duck River, in Tennessee, is connected with the Reliance Engineering Company, Cincinnati, Ohio. He states that the plan is still indefinite, but that the production of 10,000 hp. is contemplated.

The destruction by fire of the American Hosiery Mill at Kernersville, N. C., with 300 Standard machines, electric plant, power house, etc., it is announced will be followed by the erection and equipment of a larger plant during the summer.

The Pearl Milling Company, Stony Point, N. C., has been incorporated with \$20,000 capital stock by R. S. Moore, B. F. Hines, N. C. Bookham and others to equip a plant for milling grain.

The Oconee River Mills, Dublin, Ga., with \$140,000 capital stock, have been incorporated by C. H. Peacock, M. H. Edwards, W. N. Leitch, S. G. Smyly and T. H. Edwards of Eastman to operate a cotton mill.

J. A. Williamson and F. G. Thomas have completed arrangements for the equipment of a large canning plant at Demopolis, Ala.

Birmingham

BIRMINGHAM, ALA., May 20, 1912.

The machinery trade is still lagging. It is quiet because of the tardy spring and backward operations at sawmills and gins, and even in mine and furnace lines nothing of an especially active nature is reported. There is a good deal of repairing being done, bringing some activity in that class of shops. Heavy rains and bad roads have hampered the delivery of boilers and pumps that have been ordered for sawmills and other plans simply because it is impossible to haul the machinery from railroad depot to site of plant. Stop shipment orders have been issued on engines and pumps on which half payment had been made. There is reported to be a good inquiry in the pumping trade from mines, but transactions are not on a large scale. A generally better demand is expected next month, by which time the gin trade will be more active and the sawmills will be able to operate more smoothly and, in addition, the roads will be dry and regular summer operations, so long delayed will be in active progress. The general outlook is good.

The Fuller Elevator Equipment Company, Birmingham, has been incorporated with \$30,000 capital stock for the purpose of manufacturing elevators. Allen A. Fuller, C. H. Simmons and R. D. Johnston, Jr., are incorporators of the company.

The Alabama Interstate Power Company has applied to the city of Montgomery, Ala., for a franchise to furnish light and power. The company, which is

S. DIESCHER & SONS
Mechanical and Civil Engineers

PITTSBURGH, PA.

reported as having the backing of a large amount of foreign capital, expects to harness water power of the Coosa River.

The Southern Utahite Powder Company, Birmingham; R. H. Bowron, R. C. Jones and others has been incorporated with a capital stock of \$50,000 to manufacture explosives.

The Southern Coal, Iron & Steel Company, Manchester City, Ala., formed to develop ore prospects, has been incorporated. Alan Jamison of Birmingham is treasurer.

The Peacock Iron Works, Selma, Ala., will locate at Gadsden, where its leading output will be car wheels for the shops of the Gadsden Car Works, which it is said it will furnish a stipulated number of car wheels per month. The Gadsden concern will, it is understood, have a capital stock of \$100,000.

The Red Clay Gravel Company, Montgomery, Ala., has been incorporated with a capital stock of \$14,000. It will operate gravel pits. L. C. Young is president.

The sawmill of G. S. Baxter & Co., Fargo, Ga., valued at \$50,000, was burned several days ago.

The Ashland Oil & Fertilizer Company will establish a fertilizer to replace the one burned at Ashland, Ala.

G. H. Malone and others, of Dothan, Ala., are organizing a \$200,000 corporation to build a large packing plant.

It is announced in Augusta, Ga., that Swift & Co. will establish an extensive cotton seed oil mill there.

The Savannah Brick Works, Savannah, Ga., were practically destroyed by fire recently.

The Georgia Oil Development Company, Waycross, Ga., has been incorporated with a capital stock of \$250,000 by L. B. McEwen and others.

A. M. Sample and associates will build an ice factory at Ft. Pierce, Fla.

The city of McDonough, Ga., will receive bids on May 27 for a waterworks and sewer system, including pipe, tanks, etc.

St. Louis

ST. LOUIS, Mo., May 20, 1912.

Aside from the interest which has been aroused by the Diesel engine plant list there has been nothing out of the ordinary in the machine tool market and the business done has been as for some time past in the single tool way. There is, however, despite the political year pessimism, a fair run of business in the aggregate with the result that dealers are not altogether as depressed as they might be. Collections are reported fair and the future prospects are reported good in a general way.

Frederick Moser, representing a Milwaukee concern, has completed the purchase of a five-acre tract in St. Louis upon which will be built a large hardwood working plant. The site adjoins the Carondelet Foundry and the cost was \$40,000.

The Bryant-Barytes Lead Company, St. Louis, has been organized with \$10,000 preliminary capital stock to equip a plant for the manufacture and preparation of all kinds of the baser metals for market. The incorporators are F. A. Mohr, Vincent L. Boisaubin and James C. Jones.

The Jungle Mining Company, Webb City, Mo., has been organized with \$10,000 capital stock by R. L. Milton, W. C. Pugh and F. B. Loomis to equip with mining machinery property owned by the incorporators.

The city of St. Louis has secured federal consent and will build an intake plant in the Mississippi River to avoid ice-clogging which threatened the city water supply last winter.

The Attica Bridge & Iron Company, Attica, Ind., has begun the work of construction of a plant at East St. Louis to cost \$1,000,000 and will remove its Indiana plant to East St. Louis as soon as the new buildings are completed.

The Commonwealth Trust Company, St. Louis, is preparing plans for the building of a 25-story structure, for which power plant estimates will be required.

The Sutherland-Pedigo-Farwell Shoe Company, St. Louis, has been incorporated with \$150,000 capital stock by J. T. Pedigo, S. G. Sutherland, F. A. Farwell and F. H. Weber, to equip and operate a specialty shoe manufacturing plant.

The Enno Sander Mineral Water Company, St. Louis, has bought a site for a large new factory which will be equipped, when built, with a complete outfit of new machinery for the preparation of mineral waters, etc.

The Hoffman Mfg. Company, Nevada, has been authorized to utilize \$25,000 of its capital in a plant at

Kansas City, Mo., for the manufacture of automatic vending machines.

A conference presided over by P. J. Hannan, of St. Louis, was held in St. Louis the past week to develop further the plans of the syndicate which is to construct a hydroelectric plant on the Ouchita River in Arkansas to supply electricity to Hot Springs, Little Rock, Pine Bluff and Argenta and to pump water to the Arkansas rice fields. The ultimate investment will involve about \$2,000,000 in construction and machinery.

The Mogul Motor Truck Company, Plano, Ill., has increased its capital stock from \$125,000 to \$500,000 to enlarge its manufacturing equipment.

The Milton Ice Company, Glen Ellyn, Ill., has been incorporated with \$50,000 capital stock by Le Roy Newton, William H. Beathke and J. Calvin Wagner to install an ice manufacturing plant.

The Mulberry Hill Coal Company, Freeburg, Ill., has increased its capital stock from \$7,200 to \$60,000 for the purpose of increasing its mining equipment.

The Bement Lumber Company, Decatur, Ill., has been incorporated with \$15,000 capital stock to equip a mill. The incorporators are B. F. Huff, R. B. Jones and W. J. Huff.

Texas

AUSTIN, TEXAS, May 18, 1912.

Industrial development continues unabated in all parts of Texas and the Southwest. The general machinery trade is in very satisfactory condition and the outlook for a continuation of the present good demand for various lines of machinery and tools is highly favorable. One of the features of the trade is the increased activity in oil development. Many wildcat wells are being bored with a view of discovering new sources of oil supply. The oil-producing territory of existing fields is being gradually extended. The situation in Mexico shows some improvement from a trade standpoint. In the states where revolutionary disturbances are not felt business is beginning to resume its normal volume.

G. H. Fuertes, consulting engineer, has completed the plans and specifications for the proposed municipal water purification plant for the city of Dallas and they are now under consideration by the City Commission. The plant will cost about \$175,000 and will care for 20,000,000 gal. a day. It will be installed so that units may be added from time to time as required.

The City Commission of Houston will submit to a vote of the taxpayers the proposition of issuing \$2,000,000 of bonds for extending the sewer system and the establishment of additional parks.

The Citizens' Ice, Light & Power Company, Marlin, has been organized with a capital stock of \$30,000. The incorporators are: W. H. Wiggins, O. B. Wiggins and F. L. Solon.

A company is being organized at Bartlett with a capital stock of \$10,000 for the purpose of installing a sewer system.

W. A. Fitch and associates, who are promoting the construction of a dam across Tule Lake, about seven miles from Corpus Christi, and the establishment of a large water storage reservoir to supply that city with water and also to irrigate a large tract of land, are negotiating with the firm of Newburg, Henderson & Loeb, Philadelphia, Pa., with a view of financing the project. Two plans are under consideration. One will create a fresh water lake covering about 80 acres and the other more than twice that area. It is also planned to run a pipe line to Corpus Christi and install a pumping station there. The reservoir will obtain its supply of water from the Nueces River.

E. H. Perry is boring 14 wells, on each of which he will install irrigating pumping plants and bring into cultivation a large tract of land near Plainview.

T. M. Vaughan of San Angelo will install a lumber mill on an 1800-acre tract of timber situated near Paris, which he recently purchased.

An election of taxpayers of Caldwell will be held May 28 for the purpose of voting on the proposition of issuing \$25,000 of bonds for the construction of a sewer system.

It is announced by Robert Miller of St. Louis, one of the men interested in the erection of a plant at Wichita Falls, Tex., for the manufacture of glass bottles, that the work of construction will soon be started.

The City Council of Teague has adopted plans for the construction of a sewer system.

The Texas Candelilla Wax Company, which recently established a factory at Marfa for making crude wax out of the candelilla plant, has adopted plans for installing a refining plant to treat the crude product. This industry is having rapid development in the upper

border region of Texas. Plants for manufacturing this wax are now completed at Sanderson, Alpine, Marfa and near Sierra Blanca. The installation of other factories is contemplated.

The City Council of Cleburne will soon let the contract for the construction of a new waterworks pumping station which will include a brick building, a 1200-ft. air compressor, the boring of an 8-in. well to a depth of 1200 ft., four miles of new 6-in. mains, one mile of 4-in. main and 30 new fire hydrants.

The land owners embraced in the San Benito drainage district adjoining San Benito voted favorably at the election on May 9 on the proposition to issue \$450,000 of bonds for the purpose of constructing a complete system of drainage for the district. The contract for the work will be let as soon as the necessary preliminary details can be arranged.

Judge Samuel Spears of San Benito and associates have purchased 987 acres of land situated near there. They will install a pumping plant and construct a canal and ditch system for the purpose of irrigating all of the tract.

The Galveston Gas Company will erect a new gas holder. It will be 135 ft. high and 70 ft. in diameter. The company will also install a large amount of machinery in its gas manufacturing plant and extend its distributing system.

The Modern Electric Supply Company, Dallas, has been organized with a capital stock of \$250,000. The incorporators are: Walter G. Endicott, W. I. Davis of Dallas and R. H. Busby of McAlester, Okla.

The Farmers' Gin Company, Paris, has been organized with a capital stock of \$8,000. The incorporators are: A. L. Stephenson, C. C. Braden, L. A. Tolbert and others.

The Red River Ginning Company will install a cotton gin at Kiomache at a cost of about \$6,000. S. J. Wright, J. W. Peterson, W. P. Gurley and George T. Wright are stockholders.

The San Benito Irrigation Company, San Benito, which has been organized with a capital stock of \$100,000, will construct a large system of irrigation to water a tract of land near there. The incorporators are: S. A. Robertson, J. C. Miller and Samuel Spears.

The Pacific Coast

SAN FRANCISCO, CAL., May 14, 1912.

While several classes of machinery are in strong and active demand, nothing new has developed in the machine tool market, which has been exceptionally dull since the first of the month. Sales for the fortnight have been to the smallest classes of trade, and there are no new inquiries worthy of special mention.

Orders for woodworking machinery are still rather scattering, though a few projects of some importance are under way. Aside from pumps, which are still in very strong demand, the principal movement is in contractors' equipment, including quarry and hoisting outfits, tramways, etc. Many quarry inquiries are based on prospects of State and county highway work, though there is considerable business connected with municipal grading and sewer contracts, irrigation ditches, etc. Electrical equipment of a general nature is in strong demand, many contractors' outfits being electrically operated, and inquiries for several large power generating plants are expected in the near future. The Geary street power house project, however, has fallen through, as the city will buy current for this line from outside parties. Work will probably be started on several gold dredges during the summer, though no definite plans have been announced. Scattering orders continue to come out for marine engines, the last order having been placed with the Craig Shipbuilding Company, Long Beach, Cal., by the Hammond Lumber Company, for a steel steamer to cost about \$300,000, with a 2000-hp. triple expansion engine and improved lumber handling devices.

Fairbanks, Morse & Co., who have a large business throughout the State in pumps, gas engines, etc., have leased the six-story fireproof building of W. & J. Sloane on Mission street near New Montgomery, for a term of 63 months. The building contains 50,000 sq. ft. and is equipped with automatic sprinklers. Fairbanks, Morse & Co. are now located on First street between Mission and Howard.

The local office of the Orenstein-Arthur Koppel Company reports a considerably larger business than at this time last year, particularly in quarry and agricultural equipment. For the last three years this company has given much attention to agricultural railways, commencing with a small portable tramway order for a fruit dryer. Such orders are now numerous, varying

from 500 ft. to several miles. Two large contracts have just been closed, one of them for a 24-in. gauge system on the 17,000-acre fruit ranch of the Parrott estate.

The local office of the Lidgerwood Mfg. Company reports many large inquiries, especially in southern California and Mexico, though the placing of orders from Mexico is held up pending the establishment of settled political conditions.

The Giant Valve & Mfg. Company, Oakland, Cal., is preparing to market a high-pressure gate valve which embodies several entirely new principles and is claimed to have many points of superiority over the present standard types. A site has been secured adjoining the C. L. Best Mfg. Company, San Leandro, Cal., and it is proposed to install a small machine shop very shortly, with a foundry later. T. M. Edmonds, assistant secretary of the Spring Valley Water Company, is president and Dave Hirstel vice-president and manager.

The Mound House Plaster Company, Emeryville, Cal., is figuring on the installation of a new calcining kettle.

The Harmon Engineering Company, working on the Humboldt Bay jetty, has ordered a 20-ton locomotive crane and a steam shovel.

The Niles Sand, Gravel & Rock Company, Niles, Cal., is installing a large gravel handling outfit, including Lidgerwood electric hoisting equipment.

The city of Alameda, Cal., has authorized an issuance of bonds in the amount of \$60,000 to provide for the installation of a new electric light system.

The city of Los Angeles is taking figures on an electric mine locomotive.

The city of San Diego, Cal., is taking figures on a large suction dredge.

The California & Hawaii Sugar Company has decided to build an additional refinery at Crockett, Cal.

The Spreckles sugar interests are putting a lot of new equipment into their lime quarry near Mt. Diablo.

The Globe Iron Works, formerly of Stockton, Cal., is now established in its new plant at Sacramento, operating forge and car shops, foundry, etc., and has opened a sales office at 807-811 L street, that city, with a stock of gas engines, pumps, mining cars, etc.

For the local garbage incinerator orders have been placed for two small turbine generator sets.

The Sierras Construction Company, San Bernardino, Cal., has ordered a 5000-kw. General Electric generator, direct connected with a horizontal Curtis steam turbine.

The Oro Electric Corporation, now operating two hydroelectric plants, is financing a project for the development of several additional power sites.

Eastern Canada

TORONTO, ONT., May 18, 1912.

The shortage of labor is a crying drawback to manufacturing enterprise. In all parts of the country the demand is urgent. Never was the volume of business offering greater than it is now. Capital is going freely into all kinds of development and manufacturing work, and though the forces of labor are being increased by immigration, there is a greater deficit of it than ever.

McGregor & McIntyre have acquired a 10-acre site in the northern part of Toronto and they will erect structural steel works.

The Nova Scotia Clay Works, Ltd., Halifax, N. S., has recently been organized for the purpose of taking over, enlarging and extending a half-dozen or more brick yards in that province. The majority of the company's plants are situated on tidewater and can ship both by water and rail. The production of the company's plant at Pugwash, N. S., is being greatly enlarged, and a new plant with every modern facility is being erected at Annapolis, N. S.

The Massey-Harris Company, Toronto, is erecting a warehouse in Calgary, Alberta.

In six months work will be begun on the Canada Car & Foundry Company's \$1,000,000 plant at Fort William, Ont.

The Hull Zyrd Company, Hespeler, Ont., will build a stove and foundry plant there.

The Stevenson Construction Company has purchased the business of the firm of Stevenson & Bray, Ltd., Montreal, and will carry on a general contracting business. The new office will be at 16 McGill College avenue, Montreal.

A 1,000,000-bu. elevator is to be constructed by the Quebec Harbor Board. It will be of steel and concrete and so built as to be capable of extension for storing 2,000,000 bu. of grain.

In Quebec city, the Harbor Commissioners have decided to inaugurate extensive improvements, which in-

clude the construction of a grain elevator of 2,000,000 bu. capacity to be erected between piers 1 and 2 of the breakwater extension connecting with the Louis embankment. About \$1,000,000 will be spent this summer.

The Acadia Coal Company, Stellarton, N. S., proposes to erect a plant there to cost \$350,000.

The Magnet Cream Separator Company will put up a factory in Hamilton, Ont., to cost \$23,000.

The Canadian Boomer & Boschert Press Company, Ltd., Montreal, will put up a new factory there.

The City of Hamilton, Ont., is calling for tenders for the material for construction of a transformer station to cost \$80,000.

It is reported that the Thomas Davidson Mfg. Company, Montreal; the Kemp Mfg. Company, Toronto, and the McClary Mfg. Company, London, are again in negotiation toward a consolidation of interests.

The works of the Anchor Mfg. Company, maker of iron bedsteads, etc., Toronto, was badly damaged by fire May 16. The total loss is about \$20,000. A new factory is to be erected without delay.

Norton Griffiths & Co. have let a big contract at St. John, N. B., to McDonald & Doheny of Alexandria, Ont., and C. L. Hervey of Montreal. It includes the construction of a breakwater a mile long and the removal of a large hill at the rear. The contract involves, it is understood, \$4,000,000.

The Jewett Refrigerator Company, Buffalo, N. Y., has established a Canadian branch plant at Bridgeburg, Ont., opposite Buffalo, having purchased the Anderson Elevator on Niagara street, which will be equipped for the company's purposes.

The A. F. Flanders Company, manufacturers of metal display fixtures for department and retail stores, Dearborn and Parish streets, Buffalo, N. Y., has purchased a building on Courtright street, Bridgeburg, Ont., which it will alter and equip for use as its Canadian branch plant.

The Mentholatum Company, 146 Seneca street, Buffalo, N. Y., has completed plans for a factory building 66 x 200 ft., two stories, which it will erect at Bridgeburg, Ont., for use of the Canadian branch of its business in the manufacture of medicinal products.

The American Gyanimid Company, Niagara Falls, Ont., which manufactures nitrates from atmospheric nitrogen obtained by electric process requiring high tension power, is completing financial arrangements for extensive enlargements to its Niagara Falls plant which it is estimated will cost about \$1,000,000.

W. Bablock, Hamilton, Ont., proposes to erect an evaporator plant to cost \$40,000.

The Capital Brewery Company, Ottawa, will erect a new building at its plant to cost \$50,000.

The Lake Erie Coal Company will increase its coal handling capacity and equipment at Walkerville, Ont.

The Dorchester Electric Company, Quebec, requires two 1000-kw. turbo generators, boiler and switchboard specifications being prepared; transformers, arc and incandescent lamps will be called for later. W. J. Wilson is general manager.

The Buffalo Brake Beam Company, Buffalo, N. Y., is negotiating for a site in Hamilton, Ont., and expects to erect plant at a cost of \$200,000.

The Union Electric & Contracting Company, Ltd., has been incorporated with a capital stock of \$150,000 to carry on a general electric and electric railway supply business with head office at Toronto.

Western Canada

WINNIPEG, MAN., May 16, 1912.

There is little change this week in the industrial situation in western Canada. Building permits are briskly forging ahead, and a considerable share of these are for industrial plants, either new or additions to established concerns. There is no noticeable falling off in the demand for machinery. There is a steady business in parts for repairs. Prospects continue very favorable all through western Canada. Collections have improved considerably since the first of this month. Seeding will soon be finished in the Middle West, and most of it has been done under very favorable conditions.

The elevator of the Maple Leaf Milling Company, Ltd., Brandon, Man., which was finished only last fall, and had a capacity of 110,000 bushels, was burned a few days ago. The loss was covered by insurance. It will be rebuilt.

The Manitoba Government has announced that it will go out of the elevator business at the end of the crop year, August 31, and the system will be either sold or leased to private parties or companies. It

has been operated at a loss. It is said that many of the elevators are badly in need of repair.

A company organized at Athabasca Landing, Alberta, headed by J. H. Wood, mayor of the town, is negotiating for the establishing of a pulp mill there. Pulp wood is quite plentiful in that locality.

The Dominion Government is preparing to construct a dock at Kenora, western Ontario. A public works official is making arrangements.

Ross & McFarlane, architects, Winnipeg, are preparing plans for a 12-story office building here for a syndicate represented by G. W. Head.

Sealed tenders addressed to the City Commissioners, Saskatoon, Sask., will be received until June 25, for the complete installation of a 70-ton per 24 hours incinerator plant, including all buildings. The commissioners are James Clinkskill, W. B. Neil and E. M. Snell.

The Saskatoon Tent & Mattress Company, Ltd., Saskatoon, Sask., is contemplating the erection of a reinforced concrete factory, to cost \$100,000.

S. W. Ross, Saskatoon, is planning to erect a seven-story store and office building, to cost \$150,000. W. S. Maxwell, Montreal, is the architect. There will be three sets of vaults on each floor, and the building will have three elevators.

Work has started on an addition to the machine shop of the Alberta Foundry & Machinery Company, Ltd., Medicine Hat, Alberta.

Work will start as soon as the plans are ready on the erection of a large plant, including a foundry, at Transcona, Manitoba, for the Winnipeg Bridge & Iron Works, Winnipeg.

The Moose Jaw Cold Storage Company has completed its plans for the construction of a \$60,000 factory in Moose Jaw, Sask.

The Tregillus Clay Products Company, Calgary, Alta., has been organized. The capital investment in lands, buildings and machinery is \$500,000. The construction of a plant in the Bow Valley, some four miles west of the city of Calgary, is now in progress. When completed it will employ 200 and ultimately 500 workmen.

The J. I. Case Threshing Machine Company will build a factory at Saskatoon, Sask., to cost \$50,000.

Tenders will be called for immediately for the construction of 10 steel bridges along the line of the Canadian Northern Railway on the Fraser and Thompson rivers, in British Columbia. The bridge plans were designed by J. A. L. Waddell, city engineer of Kansas City. Mr. Waddell states that all the bridges must be completed within the next 12 months. The first one will be a 420-ft. arch span across the Fraser River, directly above the Canadian Pacific Railway bridge at Casco, a few miles below Lytton. Then comes a semi-cantilever bridge across the same river at Lytton. The entire cost of the bridges will be \$1,250,000.

Government Purchases

WASHINGTON, D. C., May 20, 1912.

The constructing quartermaster, Fort Sill, Okla., will open bids June 10 for constructing and installing electric motor-driven pump and motor, water purifying apparatus and oil burners, oil pumps, oil storage tanks, etc.

The time for opening bids for the pumping plant at St. Mary's Falls Canal, Sault Ste. Marie, Mich., has been extended from May 7 to May 17.

The Paymaster General, Navy Department, Washington, will open bids June 4, under schedule 4546, class 51, for one electric jib crane and under schedule 4531, class 11, bids will be opened May 28 for 42 transformers.

The constructing quartermaster, Fort Slocum, N. Y., opened bids May 7 for furnishing and installing coal handling equipment as follows:

W. J. Haskins, New York, \$4741; George Haiss Mfg. Company, New York, \$3870; R. H. Beaumont, Philadelphia, Pa., \$4447; New Jersey Foundry & Machine Company, New York, \$3460; C. W. Hunt Company, West New Brighton, S. L., \$4170 and Mead-Morrison Mfg. Company, New York, \$6021.

The constructing quartermaster, Fort Sheridan, Ill., opened bids May 3 for furnishing and installing a pressure filtration plant, etc., as follows:

Item 1, filters, International Filter Company, Chicago, Ill., \$24,700; American Water Softener Company, Philadelphia, Pa., \$13,650; Roberts Filter Company, Philadelphia, Pa., \$14,580, \$15,750 and \$13,625; New York Continental Jewel Filtration Company, New York, \$17,900. Item 2, tables, American Water Softener Company, Philadelphia, Pa., \$1500; New York Continental Jewel Filtration Company, New York, \$2000. No bids were received on pumps.

